# ANNUAL SUMMARY 1933.

## PART C.

## STORMS AND DEPRESSIONS.

### DEPRESSIONS AND CYCLONIC STORMS.

During the year 7 storms and 8 depressions formed in the Bay of Bengal, 1 storm and 4 depressions in the Arabian Sea and one depression over Bihar. The dates on which the storms occurred and the greatest barometric depths observed are summarised in the Table below :—

TABLE.

| Locality. | Month. | Date. | Greatest observed barometric depth. |
|---|---|---|---|
| Arabian Sea . . . | May . | 13—19 | 1·20″ |
| Bay of Bengal . . . | May . | 22—26 | 0·35″ |
| Bay of Bengal . . . | June . | 14—16 | 0·25″ |
| Bay of Bengal . . . | August . | 2—4 | 0·35″ |
| Bay of Bengal . . . | September | 17—21 | 0·35″ |
| Bay of Bengal . . . | October . | 13—22 | 0·40″ |
| Bay of Bengal . . . | November. | 14—19 | 0·90″ |
| Bay of Bengal . . . | December | 12—17 | 1·00″ |

The detailed descriptions of these storms and depressions are, as usual, followed by a list of western disturbances of the year, of the more important local storms, and of the localities in which winds of force 9 or more were experienced by ships in the Indian Seas.

1. *Western Depression, 21st—23rd February 1933.*—A western disturbance which lay as a deep depression over the Persian Gulf on the 21st morning caused moderate to strong winds and rough seas accompanied with rain on the Mekran coast on that day and lay over the north Arabian Sea to the south of the Mekran coast on the next morning; Pasni had an easterly gale accompanied with thunderstorm and rain at 8 hrs. on the 22nd. E'ly to NE'ly winds of force 7 to 8 and rough seas continued on the coast during the day; *S. S. Varsova* bound for Karachi from the Persian Gulf also reported strong easterly wind with rainsqualls and very rough sea at 18·30 hrs. near Lat. 24½°N., Long. 63½°E. With the depression moving away eastward the weather moderated on the Mekran coast. The depression lay over Gujarat on the 23rd morning and moved eastwards across the country thereafter.

2. *Low pressure area off Malabar-Kanara, 9th—11th April 1933.*—Signs of accentuation of the seasonal low in the south of the Bay of Bengal were noticeable after the 1st April and Ceylon had fairly widespread rain on the 4th and 5th. Pressure fell appreciably in the Madras Presidency between the 6th and 7th and in Mysore, Malabar, Kanara and southeast Arabian Sea between the 7th and 8th. Upper winds upto 1 Km. over Colombo which were westerly (force 4) on the 7th morning backed to between southwest and south (force 3 to 5) by the 8th morning. On the 9th morning a low pressure area appeared off north Kanara in the neighbourhood of Laccadives and upper winds upto 2 Km. over the Peninsula were blowing from between east and southeast (force 3 to 7). With this the rainfall extended into the west of the Peninsula on the 9th. Between the 9th and 10th pressure rose appreciably over the Peninsula but fell somewhat in the southeast Arabian Sea in the neighbourhood of Minicoy and the low pressure area was located to the west of Laccadives on the 10th. The low pressure area persisted there, till the next day, when it became unimportant. Widespread thunderstorm rain also occurred in Malabar, Kanara and Mysore on the 10th and 11th.

3. *Unsettled Conditions, 22nd—26th April 1933.*—On the morning of the 22nd April a trough of low pressure appeared in the south Bay of Bengal. During the course of the next 24 hours it gradually extended from the south to central Bay without showing any signs of intensification. On the afternoon of the 24th, the trough of low pressure was concentrating between Diamond Island and the Andamans as shown by the following :—

(*a*) The marked and concentrated pressure fall on the afternoon of the 24th over the region between Port Blair and Diamond Island.

(*b*) The 18·30 hours observations from *S. S. Jalaveera* (11·8° Lat., 90·1° Long.) which reported northwesterly wind force 3.

(*c*) On the morning of the 25th widespread rainfall occurring at stations along the Tenasserim coast and over the Irrawady and Pegu divisions, Diamond Island reporting 3″ and Amherst 4″.

By the next morning the conditions became markedly unsettled from the Andaman Sea to the east Central Bay and pressure was falling rapidly in the north Andaman Sea. From the morning upper winds it appeared that a cyclonic circulation had established itself upto about 2 Km. height. On the afternoon of the 25th conditions appeared favourable for the formation of a depression with central region near Lat. 13°N., Long. 95°E. Thereafter however the unsettled conditions were less marked and became unimportant by the afternoon of the 26th.

The eastward movement of these unsettled conditions towards Burma caused widespread rain in Tenasserim and

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in the Pegu and Irrawady divisions between the 24th and 26th.

This is an interesting example of unsettled conditions during which, in spite of a report of northwesterly wind of force 8 and concentrated pressure fall from the affected region, a depression failed to develop.

4. *Low pressure area off Malabar, 3rd—6th May 1933.*—A fall in pressure occurred to the west of Ceylon between the 30th April and 1st May. Pressure fell further in the west of the Peninsula and the east Arabian Sea between the 1st and 2nd. Upper winds upto 1 Km. at Colombo and Trivandrum which were light southwesterly and moderate northwesterly on the 1st morning backed to south and southeast respectively and were of force 2-4 on the 2nd morning; this change indicated an incursion of humid winds over the south of the Peninsula and the southeast Arabian Sea. By the 3rd morning a shallow low pressure area appeared in the southeast Arabian Sea between Malabar and Laccadives; the upper winds at Colombo had backed further to southeast; also the upper winds upto 2 Kms. at Mangalore, which were blowing from between northwest and northeast on the 2nd morning, had backed and were from between southeast and southwest on the 3rd morning. Widespread rain occurred in Malabar, and both Amini Divi and Minicoy had also rain on the 3rd. By the 4th morning the surface wind at Minicoy which was northnortheasterly (force 1) on the 3rd morning had become squthwesterly (force 4), the pressure in the Laccadives had risen and the upper winds along the Malabar coast had weakened and were getting out of the influence of the low pressure; these changes indicated a somewhat westerly movement and also probably filling up of the low pressure area. Ships' observations as well as observations from Minicoy in the course of the next two days indicated that the low pressure area moved further westwards and became unimportant by the 7th morning.

5. *Severe Storm of 13th to 19th May 1933.*—Signs of arrival of southeasterly to southerly air in the southwest of the Bay of Bengal between 0·5 and 1·5 Km. were noticeable after the 6th May. Colombo had 5″ of rain on the 8th and on the 9th morning light southeasterly winds were reported by ships from the southwest of the Bay. On the 9th a concentrated fall in pressure occurred in the Laccadives and the adjoining parts of the southeast Arabian Sea and rainfall extended into Malabar and further westwards into Minicoy which also had 4″ of rain on that day. A low pressure area appeared in the southeast Arabian Sea on the 10th morning; it moved slightly northwards, pressure falling further along and off Kanara and the Konkan. By the 11th morning the upper winds upto about 1 Km. at Colombo and 2 Km. at Trivandrum were under the influence of the low pressure area in the southeast Arabian Sea, those at Trivandrum being easterly to southeasterly.

The observations from Amini Divi and Minicoy as well as from ships on the 12th morning indicated that the low pressure area was then concentrating into a depression. The upper winds at Trivandrum had veered to south and also strengthened (force 3-5); this change together with the change in upper winds at other stations in the Peninsula indicated that the disturbance was moving northwards. By the 13th morning the wind at Minicoy which was southeasterly and light on the previous morning had veered to a southwesterly wind of force 6 from a light southeasterly breeze on the previous morning, and a depression had formed by this time with central region in the neighbourhood of Lat. 9°N., Long. 70°E.; Amini Divi had 3″ of rain on the 12th. The changes in the upper winds over the Peninsula between the 12th and 13th however did not indicate a further intensification of the depression.

Observations from Minicoy on the 14th morning indicated that the depression had either weakened somewhat or moved to the northwest of Minicoy. The upper winds upto 2 Kms. in the Peninsula were not under the influence of the depression on the 14th morning although they continued to do so at higher levels. However, in the course of that day the upper winds over the Peninsula in the lower levels were again gripped by the depression and strengthened somewhat. Also a rain belt, indicating the existence of a front and extending from the north Konkan to Berar, had appeared on the 15th morning, and widespread rain had fallen over that region in the previous 12 hours. A somewhat similar type of front is often very well marked in storms during the post-monsoon period when the continental air mass is colder than the air mass from the Indian seas. It is difficult to locate the centre on the 15th with any degree of accuracy in the absence of observations from near the central region. The upper winds in the Peninsula on the 15th morning however indicated a northward movement of the depression and by 8 hrs. of the 16th the depression had probably already developed into a storm which was then centred near Lat. 16°N., Long. 69°E. *S. S. City of Swansea* bound for Bombay from Aden experienced near Lat. 17½°N., Long. 66½°E. northnortheasterly wind of force 4 to 5 at 4 hrs. on the 16th morning; thereafter as she moved eastwards she experienced stronger winds, the force having risen to 7 by 8 hrs. An extract from her log is given below.

*Log of S. S. City of Swansea for 16th and 17th.*

| Date. | Hour. | Position. | | Pressure. | Wind. | | Sea. | Swell. | Weather Remarks. |
|---|---|---|---|---|---|---|---|---|---|
| | | Lat. N. | Long. E. | | Dir. | Force. | | | |
| | | ° ′ | ° ′ | | | | | | |
| 16th . . | 4 | .. | .. | 29·69 | NNE | 4-5 | Moderate, NNE . | Heavy, SE . . | Sky partly cloudy. |
| | 8 | 17 33 | 67 02 | 29·71 | NNE | 6-7 | High, NNE . . | Heavy, NNE . | Overcast and rain. |
| | 12 | 17 43 | 67 40 | 29·65 | NE/E | 7-8 | High, confused . | Heavy, confused . | Overcast and rain. |

*Log of S. S. City of Swansea for 16th and 17th*—contd.

| Date. | Hour. | Position. | | Pressure. | Wind. | | Sea. | Swell. | Weather Remarks. |
|---|---|---|---|---|---|---|---|---|---|
| | | Lat. N. | Long. E. | | Dir. | Force. | | | |
| | | ° ′ | ° ′ | | | | | | |
| 16th . . | 14 | .. | .. | 29·57 | NNE | .. | .. | .. | .... |
| | 16 | .. | .. | 29·49 | NNE | 9 | Very High, NNE . | Heavy, NNE . | Frequent violent rain squalls. |
| | 18 | .. | .. | 29·49 | NE | .. | .. | .. | .... |
| | 20 | .. | .. | 29·51 | ENE | 8-10 | High, ENE . . | Heavy, ENE . | Continued heavy rain. |
| | 21 | .. | .. | 29·53 | NE/N | 9 | .. | .. | .... |
| | 22 | .. | .. | 29·53 | NE/N | 8-9 | .. | .. | .... |
| | 23 | .. | .. | 29·55 | NE | 8 | .. | .. | .... |
| | 24 | .. | .. | 29·57 | NE | 8 | High, NE . . | Heavy NE . . | Heavy lightning and rain. |
| 17th . . | 1 | .. | .. | 29·56 | N | .. | .. | .. | .... |
| | 2 | .. | .. | 29·51 | N/E | .. | .. | .. | .... |
| | 3 | .. | .. | 29·49 | N | .. | .. | .. | .... |
| | 4 | .. | .. | 29·51 | NNW | 7-8 | High, NNW . | Heavy, NNW . | Occaisonal heavy squalls. |
| | 6 | .. | .. | 29·57 | .. | .. | .. | .. | .... |
| | 8 | 18 19 | 68 53 | 29·61 | NNW | 6 | High, NNW . | Heavy, NNW . | Overcast and squalls. |
| | 12 | 18 26 | 69 08 | 29·63 | WNW | 5 | High, WNW . | Heavy, WNW . | Overcast and squalls. |
| | 16 | .. | .. | 29·57 | W | 4 | Rough, W . . | Moderate, W . | Showery. |

From the log of *S. S. City of Swansea* it will appear that the storm had winds of force 8 to 10 to the north of its centre ; as is also generally found to be the case in the storms of the post-monsoon period, the strong winds being generally to the south of the centre in the case of pre-monsoon storms. The storm seems to have intensified during the 16th and was probably of severe intensity by that evening. *S. S. Bhutan* bound for Aden from Bombay, an extract from whose log is given below, also experienced the full force of the storm on the 16th-17th night. She recorded the lowest pressure reading of 28·64″ at 11-30 P.M. on the 16th, the pressure having fallen by 1·20″ since 8 hrs. in the morning when she had left Bombay ; it appears that the cyclone had a belt of hurricanes but it is not known if it had a calm centre. The *S. S. Bhutan* probably passed to the south of the centre of the cyclone, and the pressure deficiency at the centre may have been more than 1·20″.

*Log of S. S. Bhutan for 16th and 17th.*

| Date. | Hour. | Position. | | Pressure. | Wind. | | Sea. | Swell. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|
| | | Lat. N. | Long. E. | | Dir. | Force. | | | |
| | | ° ′ | ° ′ | | | | | | |
| 16th . . | 8 | .. | .. | 29·84 | WSW | 2 | Calm . . . | No swell . . | Sky partly cloudy. |
| | 12 | 18 37 | 71 48 | 29·76 | WSW | 2 | Calm . . . | Moderate, WSW . | Light rain. |
| | 16 | .. | .. | 29·64 | NE | 4-5 | Moderate, SW . | Moderate, SW . | Continuous rain. |
| | 18 | .. | .. | .. | E | .. | .. | .. | .... |
| | 19 | .. | .. | 29·57 | SE | .. | .. | .. | .... |
| | 20 | .. | .. | 29·59 | S | 7 | High, confused . | Heavy, confused . | Frequent heavy rain squalls. |

*Log of S. S. Bhutan for 16th and 17th*—contd.

| Date. | Hour. | Position. | | Pressure. | Wind. | | Sea. | Swell. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|
| | | Lat. N. | Long. E. | | Dir. | Force. | | | |
| 16th—*contd.* | 22 | .. | .. | 29·55 | ESE | 8 | .. | .. | .... |
| | 23·30 | .. | .. | 28·64 | .. | .. | .. | .. | .... |
| | 23·40 | .. | .. | 28·70 | .. | .. | .. | .. | .... |
| | 24 | .. | .. | 29·16 | Confused | 12 | Confused . . | Confused . . | Overcast sky, squalls. |
| 17th . . | 1 | .. | .. | .. | Var. | 12 | .. | .. | .... |
| | 2 | .. | .. | 29·46 | WSW | 10 | High, WSW. . | Heavy, WSW . | .... |
| | 3 | .. | .. | 29·48 | W | 8 | .. | .. | .... |
| | 4 | .. | .. | 29·52 | W | 7 | High, W . . | Heavy, W . . | .... |
| | 5 | .. | .. | 29·55 | .. | .. | .. | .. | .... |
| | 6 | .. | .. | 29·55 | NW | 6 | .. | .. | .... |
| | 7 | .. | .. | 29·61 | .. | .. | .. | .. | .... |
| | 8 | 17 39 | 67 34 | 29·64 | N | 6 | Rough, N . . | Moderate, N . | .... |
| | 10 | .. | .. | 29·61 | .. | .. | .. | .. | .... |
| | 11 | .. | .. | 29·67 | .. | .. | .. | .. | .... |
| | 12 | 17 27 | 66 43 | 29·70 | N/W | 5-6 | Confused, N. . | Confused, N. . | Sky partly cloudy, occasional rain. |

The cyclone moved in a northnortheasterly direction after the 16th morning and was centred near Lat. 19°N., Long. 69°E. at 8 hrs. on the 17th. A narrow belt of rain extended from the Gujarat coast to Patna in Bihar on the 17th morning. Upper winds at Bombay upto 1·5 Km. (the balloon having been lost in clouds at that height) which were from south-southeast and of force 6-8 in the morning veered thereafter and were blowing from south in the afternoon, indicating northeastward movement of the cyclone; at Ahmedabad, in the afternoon, the upper winds were from northeast and of force 8-10 upto 1·5 Km. (the limit of the flight). While approaching the Kathiawar coast on the 17th afternoon the cyclone weakened into a depression as indicated by the observations of *H. M. S. Enterprise* and of *S. S. Garmula.* A summary of the observations of these two ships is given below :—

*H. M. S. Enterprise.*

| Date. | Time I. S. T. | Position. | | | | Wind. | | Swell. | Weather Remarks. |
|---|---|---|---|---|---|---|---|---|---|
| | | Lat. N. | | Long. E. | | Dir. | Force. | | |
| | | ° | ′ | ° | ′ | | | | |
| 17th May 1933 . | 08·30 | 21 | 54 | 68 | 48 | NE/E | 5 | Moderate, SE . | Cloudy. |
| | 15·30 | 20 | 50 | 70 | 10 | NE/E | 10 | Moderate, NE . | Rain in last hour. |
| | 19·30 | 20 | 21 | 70 | 48 | SSE | 8 | Moderate, SE . | Precipitation within sight. |
| | 22·30 | 20 | 01 | 71 | 13 | S | 7 | Moderate, SE . | Partly cloudy. |
| 18th May 1933 . | 01·30 | 19 | 36 | 71 | 43 | SSW | 7 | Moderate, S . | Partly cloudy. |
| | 04·30 | 19 | 12 | 72 | 10 | SW/W | 4 | .. | Partly cloudy. |

*S.S. Garmula.*

| Date. | Time I. S. T. | Position. | | Pressure. | Wind. | | Sea. | Swell. | Weather Remarks. |
|---|---|---|---|---|---|---|---|---|---|
| | | Lat. N. | Long. E. | | Dir. | Force. | | | |
| | | ° ′ | ° ′ | | | | | | |
| 17th May 1933 . | 06·30 | 20 0 | 71 12 | 29·56 | ENE | 7 | Rough . . | Moderate, E . | Intermittent moderate rain. |
| | 12·30 | 20 30 | 70 36 | 29·56 | NE | 6 | Rough . . | Moderate, E . | Intermittent moderate rain. |
| | 16·30 | 20 24 | 70 06 | 29·36 | NE | 7 | High . . | Moderate, SE . | Rain accompanying with squalls. |
| | 19·30 | 20 24 | 70 30 | 29·34 | SSE | 7 | Rough . . | Moderate, SE . | Overcast. |
| | 22·00 | 20 24 | 70 42 | 29·39 | S | 6 | Rough . . | Moderate, SE . | Ugly threatening sky. |
| 18th May 1933 . | 03·30 | 20 18 | 71 42 | 29·48 | SW | 4 | Rough . . | Moderate, SE . | Overcast. |

The centre of the depression was near Lat. 20°N., Long. 70°E. at 21 hrs. on the 17th and both these vessels were near the centre between 19 hrs. and 22 hrs. The depression weakened further while approaching the Kathiawar coast and passed inland slightly to the west of Veraval between 2 and 3 hrs. on the 18th. From the barometer readings at Veraval it appears that the pressure deficiency at the centre of the depression at the time of its passage inland may not have been more than 0·30″. The depression continued to move slowly northeastwards through Kathiawar and filled up to the east of Cutch on the 19th.

It is reported that the rain which occurred in Gujarat in connection with this storm did damage to property there.

6. *Storm of 22nd—26th May 1933.*—On the morning of the 20th May the ships' observations showed that the southwest monsoon was strengthening in the neighbourhood of Ceylon and was being directed towards the Tenasserim coast. One inch of rain had already fallen at Port Blair and light but widespread showers were reported from Tenasserim. Pressure was markedly in defect at Port Blair. By the next morning signs of a feeble cyclonic circulation setting in to the west of the Andamans were noticeable. In this connection the following ships' observations are interesting.

| Date. | Steamer. | Hour. | Position. | | | | Wind. | | Remarks. |
|---|---|---|---|---|---|---|---|---|---|
| | | | Lat. N. | | Long. E. | | Dir. | Force. | |
| | | | ° | ′ | ° | ′ | | | |
| 21st May 1933 . | "Ethiopia" . . . . | 06-30 | 14 | 3 | 86 | 7 | NNW | 1 | Smooth sea. |
| | "Nurjehan" . . . | 06-30 | 12 | 0 | 89 | 4 | SW | 2 | Slight sea. |
| | "Erinpura" . . . . | 08-00 | 14 | 8 | 90 | 8 | ESE | 2 | Slight sea. |
| | "Masimpur" . . . | 08-00 | 14 | 7 | 91 | 1 | SE | 2 | Smooth sea. |

Widespread thunderstorms were reported from south Burma and Tenasserim. The pressure departure in the Bay was above normal to the north of Lat. 18°N. and below normal to the south of it.

By the morning of the 22nd a depression formed in the Bay with centre within a degree of Lat. 12°N., Long. 88°E. The depression intensified during the course of that day without showing any signs of appreciable movement. By early morning of the 23rd, it began to move in a northeasterly direction and, at 8 hours, was centred near Lat. 14°N., Long. 90°E. By the afternoon it had concentrated into a cyclonic storm which continued to move in a northeasterly direction. Diamond Island surface wind, which was ESE'ly 6 at 8 hrs. of the 23rd became SE'ly 8 at 11 hrs. and further strengthened to force 12 at 23 hrs. (of the 23rd). These changes suggested that the storm, while moving in a northeasterly direction, was further intensifying.

The following reports from Port Officer, Rangoon and Wireless Officer, Diamond Island are very interesting :—

The Port Officer, Rangoon remarked—

"*23rd May 1933.*—Overcast, light rain, squally, general direction ESE, SE ; strongest gust 41 m.p.h. at 7-52 A.M. from southeast.

*24th May 1933.*—Overcast, heavy rain, squally, general direction SE, SSE strongest gust 51 m.p.h. at 9-6 A.M. from south.

*25th May 1933.*—Overcast, rainy, squally, direction ESE, SE, SSE. Strongest gust 56 m.p.h. at 11-40 A.M. from south."

The Officer-in-charge, Radio Office, Diamond Island, remarked—

"On the 23rd from 21 to 0 hrs. sky mainly overcast. Moderate gale with intermittent vigorous squalls and light

drizzle. Direction southeastward. Sea moderate to rough. Swell of moderate height and of average length.

On the 24th at 0 hr. severe thunderstorm with heavy rain accompanied by vigorous squalls and hurricane force of breeze (66 miles per hour). Sky overcast. Sea very rough. Swell heavy and of average length.

From 0 to 3 hours thunderstorm continues with heavy rain. Intermittent vigorous squalls. Fresh gale direction southeastward, sea very rough, swell heavy and of average length.

From 3 to 6 hours thunderstorm continued. Breeze dropped in strength to strong intermittent light squalls with rain. Sea rough. Swell heavy and of average length from southeast.

From 6 to 8 hours thunderstorm at time of observation. Sky overcast with nimbus clouds. Breeze dropped in strength to moderate. Direction inclined to vary from south to southsouthwest. Intermittent heavy rain, sea rough. Swell still heavy and of average length.

From 8 to 12 hours sky overcast. Breeze increasing from moderate to moderate gale. Direction southward. No squalls. Intermittent moderate rain. Sea rough. Swell still heavy and of average length.

From 12 to 15 hours sky overcast. Moderate gale continues. Direction southeastward. Intermittent light to heavy rain. No squalls. Sea rough. Swell heavy and of average length. Direction southeast.

From 15 to 18 hours sky overcast. Moderate gale continues with occasional vigorous squalls accompanied with slight drizzle. Direction southeast. Sea rough, swell heavy with average length. From 18 to 20 hours variable sky. Breeze decreased to strong breeze. Direction southsoutheast. No squalls, or rain. Sea rough, swell heavy and of average length. From 20 to 0 hours sky mainly overcast. Breeze fresh gale with frequent vigorous squalls accompanied with rain. Direction southwards. Sea very rough. Swell heavy and of average length."

At 17 hrs. of the 23rd the storm was centred within a degree of Lat. 15°N., Long. 91°E. Thereafter the storm took apparently a more northerly course and on the morning of the 24th it was centred within a degree of Lat. 16°N., Long. 91°E. The monsoon was strong to the south and east of the storm centre and nearly general rain fell in the Irrawady and Pegu divisions and Upper Burma. At this stage pressure departure near the centre of the storm was at least of the order of —0·3″ and the cyclonic circulation over the Bay had extended upto at least 3 km. height. The three ships *S. S. Kutsang*, *S. S. Arankola* and *S. S. Warina* were at different stages close to the centre of the storm. Portions of their logs for the disturbed period are given below. These indicate that probably at no time winds of gale or storm force were experienced in the immediate vicinity of the centre of the storm.

"*Kutsang.*"

| Date. | Hour. | Position. | | Wind. | | Sea. | Swell. | Remarks. |
|---|---|---|---|---|---|---|---|---|
| | | Lat. N. | Long. E. | Dir. | Force. | | | |
| | | ° ′ | ° ′ | | | | | |
| 23rd May 1933 . . | 08·00 | 11 5 | 95 4 | SW/S | 5 | Very rough . | .. | .... |
| | 09·30 | 12 0 | 95 2 | SW | 4 | Moderate . | Moderate, SW . | Moderate T. S. with rain. |
| | 14·30 | 12 7 | 94 6 | SW | 6 | Very rough . | Heavy, SW . . | Squalls (showers, squalls). |
| 24th May 1933 . . | 00·30 | 14 2 | 93 5 | SSW | 6 | Rough . | Moderate, SW . | Intermittent slight rain (showers, squalls). |
| | 08·00 | 15 4 | 92 3 | SW/S | 5 | Rough . | Moderate, SW . | Rain. |
| | 09·30 | 15 5 | 92 3 | SSW | 5 | Moderate . | Moderate, SW . | Rain (showers, squalls). |
| | 14·30 | 16 5 | 91 8 | S | 3 | Moderate . | Moderate, S . . | .... |
| | 22·00 | 17 4 | 91 0 | S | 3 | Moderate . | Moderate, S . . | (Showers.) |
| 25th May 1933 . . | 00·30 | 17 8 | 90 7 | W | 1 | Slight . . | Low, SW. | .... |
| | 08·00 | 18 7 | 89 1 | N | 4 | Moderate . | Moderate, N. | .... |
| | 09·30 | 19 0 | 89 7 | NE | 5 | Moderate . | Low, S. | .... |
| | 12·30 | 19 6 | 89 5 | NNE | 5 | Rough . | Confused, N. | .... |
| | 14·30 | 19 5 | 89 2 | N | 5 | Rough . | Confused, N . . | (Rain shower.) |
| | 15·30 | 19 8 | 89 0 | NNE | 5 | Rough . | Confused, N . . | (Showers.) |
| | 17·30 | 20 0 | 89 7 | NNE | 3 | Moderate . | Moderate, S. . . | .... |

"*Arankola*".

| Date. | Hour. | Position. | | Wind. | | Sea. | Swell. | Remarks. |
|---|---|---|---|---|---|---|---|---|
| | | Lat. N. | Long. E. | Dir. | Force. | | | |
| | | ° ′ | ° ′ | | | | | |
| 23rd May 1933 . . | 00-30 | 20 6 | 88 7 | SE | 3 | Slight . . | Low, SE. | .... |
| 24th May 1933 . . | 06-30 | 19 8 | 88 5 | ESE | 5 | Moderate . | Moderate, SE . | Shower of slight or moderate rain. |
| | 09-30 | 19 3 | 90 0 | ESE | 4 | Moderate . | Moderate, SE. | .... |
| | 15-30 | 18 5 | 91 9 | ESE | 5 | Moderate . | Heavy, SE . . | (Showers.) |
| | 17-30 | 18 2 | 91 2 | ESE | 3 | Moderate . | Heavy, SE . . | Moderate rain (showers). |
| | 21-30 | 17 7 | 91 7 | S | 3 | Moderate . | Heavy, SE . . | Showers with squalls (showers). |
| 25th May 1933 . . | 06-30 | 16 5 | 93 0 | SSW | 6 | Rough . | Heavy, S . . | Heavy T. S. with rain (rain, squalls). |
| | 09-30 | 16 2 | 93 4 | SSW | 6 | Rough . | Heavy, S . . | Rain with squalls (rain, squalls). |
| | 15-30 | 15 6 | 94 4 | SSW | 6 | Rough . | Heavy, S . . | (Rain). |

"*Warina.*"

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 23rd May 1933 . . | 15-30 | 15 7 | 93 7 | SSE | 4 | Moderate . | Moderate, SE . | (Showers.) |
| | 17-30 | 16 1 | 93 8 | SE | 5 | Moderate . | Moderate, SE . | (Showers.) |
| 24th May 1933 . . | 09-30 | 16 8 | 92 8 | ENE | 3 | Moderate . | Moderate, SE . | Overcast with KN (showers). |
| | 14-00 | 17 6 | 91 9 | SE | 4 | Moderate . | Moderate SE . | Rain. |
| | 17-30 | 17 8 | 91 9 | SSE | 5 | Moderate . | Moderate, E | .... |
| 25th May 1933 . . | 09-30 | 19 2 | 90 2 | NE/N | 4 | Slight . . | Moderate. | .... |
| | 13-00 | 19 7 | 89 6 | NNE | 6 | Rough . | Moderate, SE . | (Showers.) |
| | 17-30 | 20 2 | 89 2 | NNE | 3 | Slight . . | Moderate, NE. | .... |

During the 24th the storm continued to move in a northerly direction and was centred within a degree of Lat. 17°N., Long. 91°E. at 17 hrs. The 23 hours observations from the following ships very close to the centre of the storm were available. They showed that winds of force 2 to 4 only were experienced near the centre.

| Date. | Steamer. | Hour. | Position. | | Wind. | | Remarks. |
|---|---|---|---|---|---|---|---|
| | | | Lat. N. | Long. E. | Dir. | Force. | |
| | | | ° ′ | ° ′ | | | |
| 25th . . . | "Kutsang" . . | 00-30 | 17 8 | 90 7 | W | 1 | Sea slight, low swell SW. |
| 24th . . . | "Kutsang" . . | 22-00 | 17 4 | 91 0 | SSW | 4 | Sea moderate, moderate swell (S), showers. |
| | "Arankola" . . | 21-30 | 17 7 | 91 7 | S | 3 | Moderate sea with heavy swell (SE), squalls, shower. |

The storm was centred next morning (25th) within a degree of Lat. 18°N., Long. 91°E. and kept on moving northwards till about 14 hours. It then recurved northeastwards and was located about 150 miles southwest of Akyab at 17 hours. As it gradually approached the Arakan-Chittagong coast, the weather along the coast deteriorated rapidly. The

following extract from the weather diary of Akyab Observer will throw light on the sequence of weather at Akyab.

"*24th May 1933.*—Intermittent drizzles from midnight to 01-00 and thunderstorms till early morning. Afterwards, sky mainly overcast till 13 hours. Drizzles 13-25 to 14-20. Thunder 14-40 to 14-42. Passing showers and drizzles and moderate rain till midnight. Wind direction changing from NE to SE and back to ENE at midnight. Wind speed varied from 10 to 20 miles per hour. Day extremely hot but night cooler.

*25th May 1933.*—Sky mainly overcast till 5 hours; afterwards rain variable intensity throughout the day. Thunder intermittent from 08-37 to 13-00 hours; thunderstorms intermittent 13-45—14-45, 18-45—19-00, 20-15—20-45. Very heavy rain with loud peals of thunder in the afternoon. Squally weather in the morning. Winds NNE to SSW, force varying between 7 to 36 miles per hour. The maximum speed was about 45 m.p.h. between 23 hours and midnight.

*26th May 1933.*—Occasional light drizzles with intermittent thunder from midnight till early morning. Continuous rain with thunder at intervals from 0645 to 11-00. Wind speed decreased from early morning."

10″ of rain occurred at Akyab between 8 hours and 17 hours of the 25th. The lowest pressure departure on record during this storm was —·350 reported by Akyab at 2 hours of the 26th when the storm centre was still about 100 miles southwest of Akyab. The storm weakened and crossed coast near Akyab on the 26th morning and rapidly filled up thereafter. It caused locally very heavy rain on the Arakan coast between 8 hours of the 25th and 8 hours of the 26th, Akyab reporting 14″, Kyaukpyu, Haka and Kanpetlet 8″ each.

The rainfall associated with this storm was widespread in Burma and Assam after the 20th, extended into Bengal, Bihar and Orissa by the 22nd and into the east United Provinces on the 23rd. In the wake of the storm the Bay monsoon established itself in Burma where it remained strong during the rest of the month.

The Irrawady and Pegu divisions in Burma had widespread heavy falls between the 23rd and the 25th. The following is an extract from the "Statesman" of the 27th May 1933.

"Rangoon has had nearly ten inches of rain during the past three days. Although there was very little wind when the heavy rain set in, a gale developed this morning during which the sailing ship "*Arya*", from Bhavnagar State, Kathiawar, charted by Messrs. Maganlal Pranjivan, Diamond Merchants and Rice Merchants of Rangoon, foundered at her moorings.

The B. I. S. S. "*Arankola*", from Calcutta, lost very little time although she experienced heavy seas. A building was struck by lightning in 37th St. Some damage was done but no one was injured.

The "*Chantala*", from Arakan ports, is over twelve hours late owing to the weather but is in no danger. She was due here at 7 o'clock this morning.

The Mandalay Mail was 1½ hours late on account of floods. The line is breached between Anlakatpa and Monywa, but this is not on the main line. Delay on the latter is due to precautionary measures. There has so far been no breach."

Some of the noteworthy falls of 5″ and above which occurred in Burma are given in the Table below :—

| Stations. | 24th. | 25th. | 26th. |
|---|---|---|---|
| | ″ | ″ | ″ |
| Kyaikto (Thaton) | .. | 7 | .. |
| Rangoon Town | .. | 6 | .. |
| Victoria Lake (Rangoon) | .. | 6 | .. |
| Hlogu (Insein) | 6 | .. | .. |
| Kyauktan (Hanthawaddy) | .. | 5 | .. |
| Tan-ma-naing (Hanthawaddy) | .. | 6 | . |
| Sidoktaya (Minbu) | .. | 5 | .. |
| Linzin (Minbu) | .. | .. | 6 |
| Mezali (Minbu) | .. | .. | 6 |
| Pauk (Pakokku) | .. | .. | 5 |
| Saw (Pakokku) | .. | 7 | .. |
| Tilin (Pakokku) | .. | 6 | .. |
| Haka (Chin hills) | .. | .. | 8 |
| Kanpetlet (Chin hills) | .. | 10 | 8 |
| Kyaukpyu | .. | .. | 8 |
| Ramree (Kyaukpyu) | .. | 6 | .. |
| An (Kyaukpyu) | .. | 7 | .. |
| Chedula (Kyaukpyu) | .. | 7 | .. |
| Akyab | .. | .. | 14 |
| Myohaung (Akyab) | .. | .. | 11 |
| Pauktaw (Akyab) | .. | 11 | .. |

7. *Slight Storm of 14th—16th June 1933.*—The following points were noticed on the 8 hours pressure chart of the 10th.

(*a*) The pressure distribution in the north and central Bay above latitude 16°N. was flat.

(*b*) The monsoon was strong to the south of latitude 17°N.

(*c*) Both on the pressure change and departure charts there were indications of the pressure falling from the north Bay to the north Andaman sea.

(*d*) Fairly widespread light to moderate rain had occurred along the whole of the Burma coast and over southwest Bengal and Orissa coast.

The above facts suggested that conditions were slightly unsettled in the north and central Bay. By the afternoon of the same day the rainfall had extended over the eastern districts of deltaic Bengal. During the course of the next 36 hours pressure continued to fall rapidly over the north and central Bay and the area of negative pressure change and departure gradually shifted westwards. By the morning of the 12th, the unsettled conditions intensified into a shallow

depression off the Orissa-Circars coast. Under its influence, the monsoon strengthened in Assam on the 11th and 12th and also extended into Bengal. Widespread thundershowers also occurred in Bihar and Orissa on the 11th and 12th. The shallow depression remained practically stationary during the next 24 hours causing fairly widespread thunder-rain again in Bengal, Bihar and Orissa, the east Central Provinces and the north Madras coast on the 13th. By the morning of the 14th, it had intensified and was centred within a degree of Lat. 18½°N., Long. 86°E. The cyclonic circulation had also extended upto about 2 Km. height in the upper air. The monsoon winds were at this stage vigorous to the south and east of the centre of the disturbance.

The logs of the following ships which were very close to the centre of the disturbance are given below :—

"*Khosrou.*"

| Date. | Hour. | Position. | | Wind. | | Sea. | Swell. | Remarks. |
|---|---|---|---|---|---|---|---|---|
| | | Lat. N. | Long. E. | Dir. | Force. | | | |
| | | ° ′ | ° ′ | | | | | |
| 14th June 1933 . . | 00-30 | 18 2 | 86 8 | SSW | 2 | Smooth . | Moderate, S . . | Showers. |
| | 06-30 | 17 4 | 86 5 | SSW | 3 | Moderate . | Confused, E . . | Rainsqualls. |
| | 08-00 | 17 6 | 86 6 | SW/S | 5-6 | Rough . | Moderate, SW . | Squally. |
| | 09-30 | 17 0 | 86 5 | WSW | 5 | Rough . | Low, SW . . | Heavy squalls. |
| | 14-30 | 16 8 | 86 2 | W | 6 | Rough . | Heavy, SW . . | Continuous rain. |
| | 21-30 | 16 2 | 86 0 | WSW | 6 | Rough . | Heavy, SW . . | Squall. |
| 15th June 1933 . . | 01-30 | 15 9 | 85 8 | SW | 5 | Rough . | Heavy, SW . . | .... |
| | 08-00 | 15 6 | 85 8 | SW | 7 | Rough . | Heavy, SW . . | Occasional rain. |
| | 09-30 | 15 2 | 86 0 | W | 6 | Rough . | Moderate, SW . | Rainsquall. |
| | 12-30 | 15 2 | 85 8 | WSW | 6 | Rough . | Heavy, SW . . | Showers. |
| | 15-30 | 14 8 | 85 5 | WNW | 6 | Rough . | Heavy, SW . . | (Rainsquall.) |

"*Jalavijaya.*"

| Date. | Hour. | Position. | | Wind. | | Sea. | Swell. | Remarks. |
|---|---|---|---|---|---|---|---|---|
| | | Lat. N. | Long. E. | Dir. | Force. | | | |
| | | ° ′ | ° ′ | | | | | |
| 14th June 1933 . . | 06-30 | 15 7 | 85 8 | WSW | 8 | Very Rough . | Heavy, SW . . | Rain (rainsquall). |
| | 08-00 | 15 8 | 85 9 | WSW | 8 | High . . | Heavy, WSW . | Rainsquall, continuous rain and squall since midnight. |
| | 14-30 | 15 3 | 86 0 | W | 8 | High . . | Heavy, W . . | Rainsquall (rain). |
| 15th June 1933 . . | 06-30 | 14 7 | 85 8 | SW | 6 | Rough . | Heavy, W . . | (Rainsquall.) |
| | 08-00 | 14 8 | 85 7 | SW | 6 | Rough . | Heavy, SW . . | Occasional heavy rain-squalls. |

During the course of the day the depression intensified further and by the afternoon it developed into a storm with centre at 17 hours within half a degree of Lat. 19°N., Long. 87°E. It did not show any sign of appreciable movement till early morning of the 15th. Later, moving in a northerly direction, it was centred about 60 miles southeast of Chand-

bali on the morning of the 15th. The following observations from stations in Orissa and ships appear to show that at this time there were no winds of storm or gale force near the centre.

| Date. | Steamer or Station. | Hour. | Position. | | Wind. | | Sea. | Swell. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|
| | | | Lat. N. | Long. E. | Dir. | Force. | | | |
| | | | ° ′ | ° ′ | | | | | |
| 15th June 1933 . | "Dara" . . | 09-30 | 19 2 | 87 8 | WSW | 4 | Moderate . | Moderate, SW | (Showers). |
| | "Maciver" . . | 05-30 | 19 9 | 88 2 | S | 4 | High . | Moderate, S . | Squally. |
| | Sandheads . . | 08-00 | .. | .. | SE | 4 | Rough . | Heavy, E . | Drizzle (½″ rain). |
| | Chandbali . . | 08-00 | .. | .. | NE | 2 | .. | .. | (T. S. 1″ rain). |
| | Puri . . . | 08-00 | .. | .. | NE | 4 | Smooth . | .. | Squally (3″ rain). |

The pressure departure near the centre of the disturbance on the 15th morning was at least —0·25″. The storm moving very slowly first in a northerly and then in a northnorthwesterly direction crossed the coast near Chandbali by 23 hours and weakened into a depression which was centred early next morning about 50 miles northwest of Chandbali. The depression persisted over Orissa till the 17th and then merged into and accentuated the seasonal trough of low pressure which extended from Baluchistan to the Orissa-Ganjam coast on the 18th morning.

The depression was responsible for an extension of monsoon into Orissa, Chota Nagpur and the east Central Provinces and for its strengthening in Hyderabad. The rainfall associated with it was widespread in northeast India, the east Central Provinces, Hyderabad and on the north Madras coast. It was also responsible for a fairly active monsoon in Lower Burma and on the west coast of the Peninsula.

8. *Account of the movement of a low pressure wave from off the Kanara-Konkan coast to Gujarat between the 18th and 23rd June and of a depression over the west United Provinces between the 24th June and 2nd July.*—A depression which formed in the north of the Bay of Bengal off the Circars-Orissa coast on the 12th stimulated the activity of the Arabian Sea monsoon on the west coast of the Peninsula upto Ratnagiri after that date. The monsoon continued fairly strong there, upto the 18th, when the depression from the Bay filled up over Orissa. Pressure rose generally over the country but fell in the east Arabian Sea on the 18th and a low pressure area appeared off the Kanara-Konkan coast on the 19th morning; Ratnagiri had 6″ of rain on the 18th. The upper winds upto 2 Km. at Bombay which had backed to south between the 18th and 19th also strengthened (force 6-8) by the 19th afternoon. The low pressure area moved slowly northwards into Gujarat by the 23rd morning, and with it the Arabian Sea monsoon also advanced northwards into Gujarat and Rajputana; at the same time the Bay monsoon extended up the Gangetic plain to the east and north Punjab, a temporary extension of the monsoon also occurring in Kashmir and the North-West Frontier Province on the 22nd.

The low pressure area which lay over Gujarat on the 23rd morning moved rapidly northeastwards in the course of that day and a shallow depression lay over the west United Provinces by the next morning; Delhi had 6″ of rain on the 23rd. The depression remained practically stationary but intensified in the course of the next three days, the pressure departure near its centre being about 0·2″ on the 27th morning when the centre lay slightly to the west of Agra. Thereafter it began to move slowly eastwards without any change in intensity and lay near Mainpuri on the 30th morning. In the course of the next two days the depression weakened without any appreciable movement and filled up by the morning of 2nd July.

The depression was responsible for a fairly vigorous monsoon over the whole region from the Konkan to the United Provinces and the east and north Punjab, rainfall being locally heavy in the neighbourhood of the depression. Continuous moderate to heavy rain in the west United Provinces caused floods there, resulting in loss of cattle and much damage to crops and property in several villages.

9. *Unsettled conditions of 27th-30th June.*—A low pressure wave moved towards Burma from the east after the 25th. The monsoon had been strong over the whole of Lower Burma, and light to moderate rain with locally heavy falls was reported from stations along the coast between Akyab and Victoria Point on the 27th morning. The low pressure area moved further westwards, and on the morning of the 28th it existed over east central Bay where it appeared to be concentrating. The pressure continued to fall over the north and central Bay thereafter and by 17 hours conditions became markedly unsettled in north and central Bay, particularly off the Circars-Orissa coast as indicated by the observations from the following ships:—

| Date. | Steamer. | Hour. | Position. | | Wind. | | Remarks. |
|---|---|---|---|---|---|---|---|
| | | | Lat. N. | Long. E. | Dir. | Force | |
| | | | ° ″ | ° ″ | | | |
| 28th June . . | "City of Worcester" . | 15-30 | 17 1 | 86 8 | WSW | 6 | Sea very rough. Swell 7. |
| | "Cranfield" . . | 15-30 | 18 5 | 87 3 | WSW | 4 | Continued slight rain. Sea slight. (Drizzle). |
| | "Cranfield" . . | 17-30 | 18 8 | 87 3 | WNW | 4 | Continued heavy rain. Sea moderate. Swell 4 (Rain). |

The unsettled conditions persisted north of latitude 18° during the next 36 hours. Between the 29th and 30th pressure fell appreciably in the north Bay between latitude 18° and 20°, longitude 90° and 92° ; on the 30th morning cyclonic circulation existed over the north Bay upto a height of about 2 kilometers. These facts suggested that conditions were becoming favourable for the formation of a depression in north-east angle of the Bay.

By the afternoon of the 30th, however, the unsettled conditions passed into Bengal without any further intensification and merged thereafter into the seasonal trough of low pressure over the Gangetic plain.

These unsettled conditions were responsible for locally heavy rain on the Chittagong coast on the 30th June and 1st July and in the northern and eastern districts of Assam on the 2nd and 3rd July. Some of the noteworthy falls of 5″ and above are given below :—

| Division. | Station. | 2nd. | 3rd. | 4th. |
|---|---|---|---|---|
| Bengal . . | Chittagong . | 7″ | 10″ | 5″ |
| | Narayanganj . | .. | 5″ | .. |
| | Rangpur . . | .. | 5″ | .. |
| | Cooch-Behar . | .. | 5″ | .. |
| Assam . . | Cherrapunji . | 11″ | 14″ | .. |
| | Gauhati . . | .. | 9″ | .. |

10. *Two depressions between 13th and 20th July.*—The monsoon generally strengthened after the 8th and rainfall extended in the interior of the Peninsula, the central parts of the country and north-east India. Conditions became unsettled off the Orissa-Circars coast on the 13th. The unsettled conditions passed inland and a shallow depression appeared over the region extending from the east Central Provinces to off the Orissa-Circars coast on the 14th morning. The depression moved towards Gujarat thereafter, intensifying at the same time and lay over Cutch and lower Sind on the 18th when it filled up. During its passage it gave widespread rain in the central parts of the country, the north of the Peninsula and Gujarat and caused an extension of monsoon into Sind and Baluchistan.

After the passage inland of the unsettled conditions mentioned above, pressure fell appreciably at the head of the Bay on the 14th and conditions again became unsettled there. By the next morning these unsettled conditions moved northwards and intensified in the north-west angle of the Bay. The following observations from some of the land stations indicated that a cyclonic circulation existed over the north-west angle of the Bay :—

| Date. | Station. | Hours. | Wind. | | Remarks. |
|---|---|---|---|---|---|
| | | | Dir. | Force. | |
| 15th July . | Chandbali . | 8 | NW | 4 | Intermittent moderate rain (Thunderstorm). |
| | Sandheads . | 8 | S | 1 | Continuous drizzle (Drizzle). |
| | Midnapore . | 8 | ENE | 2 | (Shower). |
| | Saugor Island | 8 | SE | 2 | |
| | Balasore . | 8 | N | 3 | |
| | Calcutta . | 8 | E | 2 | Intermittent drizzles (Thunderstorm). |

With the northward movement of the unsettled conditions the monsoon became strong in the south of latitude 20°. These unsettled conditions passed inland as a low pressure wave and by the morning of the 16th a depression of small extent formed on land with centre at 8 hours about 40 miles north-east of Balasore. The following observations indicate the activity of the depression :—

| Date. | Station. | Hour. | Wind. | | Remarks. |
|---|---|---|---|---|---|
| | | | Dir. | Force. | |
| 16th July 1933 | Saugor Island . | 8 | S | 8 | Rain-squall (squally). |
| | Balasore . . | 8 | SW | 3 | Continuous rain (Thunderstorm). |
| | Calcutta . . | 8 | ESE | 3 | Intermittent rain. |
| | Midnapore . | 8 | NE | 2 | Drizzle and rain (Thunderstorm). |

It took up a west-north-westerly course, and next morning it lay over Chota Nagpur and adjoining parts of the east Central Provinces. The depression continued to move along the same course until it merged into the seasonal low over north-west India on the 20th. It was responsible for widespread and locally heavy rain especially to the south of its track. The falls were locally very heavy in west Central India and Sind where considerable damage to life and property is reported to have occurred.

The following are some of the noteworthy heavy falls of rain recorded in connection with the above two depressions :—

| Station. | 13th. | 15th. | 16th. | 17th. | 18th. | 19th. | 20th. | 31st. |
|---|---|---|---|---|---|---|---|---|
| | ″ | ″ | ″ | ″ | ″ | ″ | ″ | ″ |
| Saugor Island . . . | .. | .. | 6 | .. | .. | .. | .. | .. |
| Sambalpur . . . | .. | .. | 5 | .. | .. | .. | .. | .. |
| Dharampur . . . | .. | .. | .. | 15 | .. | .. | .. | .. |
| Baihar . . . . | .. | .. | .. | 7 | .. | .. | .. | .. |
| Dhuti . . . . | .. | .. | .. | 7 | .. | .. | .. | .. |
| Harda . . . . | 9 | .. | .. | .. | .. | .. | .. | .. |
| Mohpani . . . . | .. | .. | 8 | .. | .. | .. | .. | .. |
| Narsinghgarh . . . | .. | .. | .. | 8 | .. | .. | .. | .. |
| Sitamau . . . . | 7 | .. | .. | .. | .. | .. | .. | .. |
| Indore . . . . | .. | .. | .. | .. | .. | 5 | .. | .. |
| Ratnagiri . . . | 6 | .. | .. | .. | .. | .. | .. | .. |
| Bulsar . . . . | .. | .. | .. | .. | 7 | .. | .. | .. |
| Surat . . . . | .. | .. | .. | .. | 5 | .. | .. | .. |

| Station. | 13th. | 15th. | 16th. | 17th. | 18th. | 19th. | 20th. | 31st. |
|---|---|---|---|---|---|---|---|---|
| | " | " | " | " | " | " | " | " |
| Dehej | .. | .. | .. | .. | .. | 7 | .. | .. |
| Pingiaj | .. | 7 | .. | .. | .. | .. | .. | .. |
| Kharagoda | .. | .. | .. | .. | .. | 8 | .. | .. |
| Mandal | .. | .. | .. | .. | .. | 7 | .. | .. |
| Veraval | .. | 7 | .. | .. | .. | .. | .. | .. |
| Dwarka | .. | .. | 11 | .. | .. | .. | .. | .. |
| Karachi | .. | .. | .. | .. | .. | .. | 5 | 7 |

11. *Depression of 24th-26th July, 1933.*—With the passage of a low pressure wave from the east across Upper Burma, conditions became unsettled over the Bay off the Chittagong Arakan coast on the 22nd. During the course of the next day these unsettled conditions intensified and gradually concentrated over the north-east Bay. By the morning of the 24th a shallow depression was formed in the north-east angle of the Bay with central region about 120 miles east of the Sandheads. The morning observations from ships in the Bay indicated that monsoon was strong over the Bay to the south of latitude 19° N., and rough seas, strong winds and rain-squalls were reported by most of the ships between latitude 15° and 19°. At 0-30 hours of the 24th *S. S. Agatha* (Lat. 18° 2′, Long. 91° 2′) reported a wind of force 8 and rainsqualls. The morning upper winds indicated that the cyclonic circulation over the north-east angle of the Bay had extended upto at least 2 kilometer height.

During the course of next twenty-four hours pressure continued to fall over north-east Bay and the depression intensified without showing any appreciable movement. By the early morning of the 25th it began to move in a west-north-westerly direction and was centred about 90 miles east-north-east of the Sandheads at 8 hours. During the course of that day it continued to move slowly west-north-westwards without showing any signs of further intensification and was centred next morning about 30 miles to the south of Saugor Island. At 11 hours it was centred about 50 miles to the ESE of Balasore. Continuing to move in the same direction it passed inland near Balasore across the north Orissa coast by the afternoon of the 26th. Next morning it lay as an elongated low over the region from Orissa to west Central India. Thereafter it became diffuse and merged into the seasonal trough of low pressure which extended from the north-west frontier to off the Orissa coast on the morning of the 28th.

The rainfall associated with this depression was widespread over the most of the country excluding north-west India. Widespread and locally heavy rain occurred on the Burma coast between the 22nd and the 28th, while on the 27th morning widespread rain was reported in and around the central parts of the country, rainfall being locally heavy in the west Central Provinces.

12. *Depression of 29th July—1st August, 1933.*—On the morning of the 28th July, the seasonal trough of low pressure extended from the north-west frontier to off the Orissa coast, while ships' observations indicated that the monsoon was strong practically over the whole of the Bay. The pressure change and departure charts at 17 hours of the same day suggested that a low pressure wave was travelling westwards across Burma.

On the morning of the 29th, the area of negative pressure change and departure extended from the Andaman sea to the Orissa-Circars coast and a trough of low pressure existed over the central Bay off the Orissa-Circars coast where conditions were becoming unsettled. The monsoon strengthened further to the south of latitude 14°. During the course of that day, the unsettled conditions intensified and, by the afternoon, developed into a depression with central region within a degree of Lat. 18°, Long. 88°, as seen from the following ships' observations.

| Date. | Steamer. | Hour. | Position. | | Wind. | | Sea. | Remarks. |
|---|---|---|---|---|---|---|---|---|
| | | | Lat. N. | Long. E. | Dir. | Force. | | |
| | | | ° ′ | ° ′ | | | | |
| 29th July, 1933 | " Howrah " | 15-30 | 17 2 | 86 5 | WSW | 7 | Rough | Rain-squal. |
| | " Egra" | 15-30 | 18 4 | 91 0 | SE | 4 | Slight. | |
| | " Aronda " | 15-30 | 20 2 | 89 1 | ESE | 3 | Slight. | |
| | " Binfield " | 15-30 | 19 6 | 87 4 | ENE | 3 | Moderate | Rain. |
| | " Sikh " | 15-30 | 19 0 | 86 2 | NE | 3 | Moderate. | |

The depression intensified further overnight and was centred next morning within a degree of Lat. 17½°, Long. 87°. The morning upper winds from stations round the Bay indicated that the cyclonic circulation over the north and central Bay had extended at least upto 3 kilometer height.

The depression caused vigorous monsoon winds to the south and west of its centre and the extract from the logs of the following ships are interesting from the point of view that winds of forces 8-10 with very high and rough seas were reported.

| Date. | Hour. | Position. | | Wind. | | Sea. | Remarks. |
|---|---|---|---|---|---|---|---|
| | | Lat. N. | Long. E. | Dir. | Force. | | |
| | | ° ′ | ° ′ | | | | |
| | | | | *"City of Adelaide."* | | | |
| 30th July, 1933 . | 08-00 | 12 1 | 84 4 | WSW | 6 | High. | |
| | 16-00 | 13 2 | 85 3 | W | 10 | High. | |
| 31st July, 1933 . | 08-00 | 15 1 | 87 3 | WSW | 6 | High. | |
| | | | | *"Ethiopia."* | | | |
| 30th July, 1933 . | 05-30 | 14 6 | 89 6 | WSW | 7 | Very Rough. | |
| | 08-00 | 14 5 | 88 5 | SW/W | 7 | High . . . | Rain-squall. |
| | 09-30 | 14 4 | 88 1 | WSW | 7 | Rough. | |
| | 15-30 | 14 4 | 87 4 | WSW | 8 | Very high . . | Squally. |
| | 20-00 | 14 2 | 87 0 | W/S | 8 | Very high . . | Squally. |
| 31st July, 1933 . | 01-30 | 14 0 | 86 6 | SW | 8 | Very high . . | Squally. |
| | 05-30 | 14 0 | 86 6 | W | 8 | .... | Rain-squall. |
| | 08-00 | 13 9 | 85 6 | W/S | 8 | Very high . . | Rain-squall. |
| | 09-30 | 13 9 | 85 9 | WSW | 8 | Very high. | |
| | 15-30 | 13 8 | 84 9 | WSW | 8 | Very high . . | Squally. |
| | 17-30 | 13 8 | 84 8 | WSW | 8 | Very high. | |
| | 20-00 | 13 6 | 84 8 | SW/W | 6 | Very high . . | Frequent squall with torrential rain from 14 to 16 hours. |
| | | | | *"Gambada."* | | | |
| 29th July, 1933 . | 06-30 | 15 5 | 84 4 | W | 8 | Very high. | |
| | 12-00 | 15 5 | 84 3 | W | 7 | High. | |
| | 15-30 | 15 3 | 84 0 | W | 8 | Very rough . . | Squally. |
| 30th July, 1933 . | 09-30 | 14 3 | 83 2 | W | 9 | Very rough . . | Squally. |
| | 12-00 | 14 3 | 82 8 | W/N | 7 | Confused. | |
| | 15-30 | 14 3 | 82 7 | W | 7 | .... | |
| | 17-30 | 14 0 | 82 5 | W | 7 | High. | |

The depression began to move slowly in a north-westerly direction and next morning (31st) was centred about 100 miles south-east of Gopalpur. At 8 hours of the 1st, it was located about 40 miles east of Gopalpur. At 11 hours Puri reported a south-easterly wind, force 3, while Gopalpur a north-westerly wind, force 2; at this time the depression was apparently crossing coast between Gopalpur and Puri. Thereafter it rapidly merged into the seasonal trough of low pressure extending from the east United Provinces to off the Circars coast.

The depression was responsible for strong monsoon in the Peninsula and the Central Provinces during most of the week ending 2nd August 1933.

13. *Storm of 2nd-4th August, 1933.*—On the morning of the 1st August, before the depression of the 29th July had passed inland, there appeared a concentrated area of negative pressure change and departure over Burma. This suggested that another low pressure wave was travelling westwards across Burma. Moving rapidly this wave passed out

into the north Bay and by the early morning of the 2nd gave rise to a depression centred within half a degree of Lat. 19° N., Long. 90½°.

Moving in a westerly direction it intensified rapidly and was centred at 11 hours within half a degree of Lat. 19° N., Long. 89° E. as a deep depression. During the course of that day it intensified still further and took a northwesterly course. At 17 hours its centre lay about 100 miles south of the Sandheads, the pressure departure near the centre at this stage being about —0·3″. In the upper air the cyclonic circulation was found to have established itself upto a height of 2 kilometres.

The pressure continued to fall rapidly and at 23 hours the pressure departure of about —·350″ was noticed near the centre which was still about 100 miles south of the Sandheads. Over-night the deep depression intensified into a cyclonic storm which was centred at 8 hours of the 3rd about 75 miles south-east of Balasore.

The storm caused vigorous monsoon winds to the south of Lat. 16° N., as seen from the extract of the logs of the following ships :—

| Date. | Steamer. | Hour. | Position. | | Wind. | | Sea. | Swell. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|
| | | | Lat. N. | Long. E. | Dir. | Force. | | | |
| | | | ° ″ | ° ″ | | | | | |
| 2nd August | "Ganges" | 06-30 | 19 8 | 89 0 | ENE | 5 | Moderate | Moderate, SW | Rain shower. |
| | "Ganges" | 09-30 | 19 4 | 89 3 | ENE | 5 | Moderate | Moderate, SW | Rain shower. |
| | "Ganges" | 12-30 | 19 4 | 89 8 | S | 3 | Moderate | Heavy, S | Shower. |
| | "Ganges" | 15-30 | 18 7 | 90 0 | SW | 6 | Very rough | Heavy, SW | Rain. |
| | "Ganges" | 17-30 | 18 2 | 90 0 | SW | 6 | Very rough | Heavy, SW | Rain. |
| 3rd August | "Ganges" | 06-30 | 16 6 | 91 1 | SW | 8 | Very rough | Moderate, SW | Rain. |
| | "Ganges" | 15-30 | 15 2 | 92 2 | SW | 7 | Very rough | Heavy, SW | Rain shower. |
| | "Ganges" | 17-30 | 15 0 | 92 6 | SW | 6 | Rough | Heavy, SW. | |
| 2nd August | "Cranfield" | 09-30 | 16 3 | 84 2 | WSW | 7 | Very rough | Heavy, SW. | |
| | "Cranfield" | 12-30 | 16 4 | 84 2 | WSW | 7 | Very rough | Heavy, SW. | |
| | "Cranfield" | 17-30 | 16 2 | 84 5 | W | 8 | Very rough | Heavy, W. | |
| 3rd August | "Cranfield" | 07-30 | 15 0 | 83 4 | WSW | 6 | Rough | Moderate, W. | |
| | "Cranfield" | 15-30 | 14 8 | 82 5 | WSW | 6 | Rough | Heavy, W. | |
| | "Cranfield" | 17-30 | 14 8 | 82 3 | WSW | 6 | Rough | Moderate, W. | |
| 2nd August | "Arankola" | 06-30 | 16 7 | 92 9 | SW | 6 | Rough | Heavy, W. | |
| | "Arankola" | 12-30 | 17 7 | 92 0 | WSW | 7 | High | Heavy, SW | Squally. |
| | "Arankola" | 17-30 | 18 3 | 90 8 | SW | 6 | Rough | Heavy, SW | Squally. |
| | "Arankola" | 22-30 | 19 2 | 90 0 | SW | 7 | Rough | Heavy, SW | Squally. |
| 3rd August | "Nirpura" | 12-00 | 20 9 | 88 3 | S | 6 | Rough | Moderate, confused | |
| | "Nirpura" | 15-30 | 20 6 | 88 7 | SSW | 6 | Rough | Heavy, S | Rainsquall. |
| | "Nirpura" | 16-00 | 20 5 | 88 7 | SSW | 6 | Moderate | Moderate. | |
| | "Nirpura" | 17-30 | 20 5 | 88 9 | SW | 7 | Rough | Heavy, S | Rainsquall. |
| | "Nirpura" | 20-00 | 20 3 | 89 1 | WSW | 6 | Rough | .... | |
| | "Nirpura" | 24-00 | 19 9 | 89 5 | SSW | 7 | Very rough | Moderate, S. | |

The extracts from logs of *F. L. V. Luna* and *L. V. Star* for the disturbed period are given below :—

"*F. L. V. Luna.*"

| Hour. | Wind. | | Weather. | | Remarks. |
|---|---|---|---|---|---|
| | Dir. | Force. | General. | Sky. | |
| | | | *3rd August, 1933.* | | |
| 2 | NE | 5 | q, r | o | Weather unsettled, heavy swell. |
| 4 | NE | 5 | q, r | o | |
| 6 | NE | 5 | q, r | o | |
| 8 | NE | 5 | Fine | c | |
| 10 | NE | 5 | Fine | c | |
| 12 | E | 5 | Fine | c | |
| 14 | SE | 5 | Fine | c | |
| 16 | SE | 5 | Fine | c | |
| 18 | S/E | 5 | Fine | o | |
| 20 | S/E | 5 | q | o | |
| 22 | SE | 7 | q | b, c | Fresh gale, with very heavy swell and rough sea. Vessel rolling heavily. |
| 23 | SE | 7 | q | b, c | |
| 24 | SE | 8 | q | b, c | |
| | | | *4th August, 1933.* | | |
| 1 | SSE | 8 | q | b, c | Fresh gale, rough sea, very heavy swell, vessel rolling very heavily. Veered away starboard coir hawser at 01-00 hours ready for vessel swinging head to wind with the turn of the tide. |
| 2 | SSE | 6 | q, r | o | |
| 3 | S | 7 | q, r | o | |
| 4 | S/W | 6 | q, d | o | |
| 5 | S/W | 5 | q, d | o | |

"*L. V. Star.*"

| Hour. | Wind. | | Weather. | | Remarks. |
|---|---|---|---|---|---|
| | Dir. | Force. | General. | Sky. | |
| | | | *3rd August, 1933.* | | |
| 21 | S | 4-5 | Squally | b, c | |
| 22 | SE | 5-6 | Squally | b, c | |
| 23 | SE | 5-6 | Squally | b, c | |
| 24 | SE | 5-6 | Squally | b, c | |
| | | | *4th August, 1933.* | | |
| 1 | ESE | 6-7 | Stormy | b, c | A. M. weather cyclonic and stormy with big swell and sea. |
| 2 | ESE | 6 | Stormy | b, c | |
| 3 | S | 4 | Stormy | b, c | |
| 4 | S | 4 | Stormy | b, c | |
| 5 | S | 3 | Stormy | o, c | |
| 6 | S/W | 3 | Stormy | o, c | Noon weather improving but big swell. |
| 7 | S/W | 4 | Stormy | o, c, d | |
| 8 | S/W | 4 | Stormy | o, c, d | |
| 9 | S | 4 | Stormy | o, c | |
| 10 | S/W | 4-5 | Fine | d, c | |

The weather in the northern sector of the storm area was also very bad as shown by the observations of *F. L. V. Luna.*

During the course of the day (3rd August) the storm continued to move slowly in a north-westerly direction. The following table shows that as the storm centre approached the Orissa coast the winds at Puri, Chandbali and Balasore changed direction and strengthened. The storm crossed coast between Chandbali and Balasore by the evening of the 3rd :—

| Date. | Station. | Hour. | Wind. | | Remarks. |
|---|---|---|---|---|---|
| | | | Dir. | Force. | |
| 3rd August, 1933 | Puri . | 17 | W | 4 | Sea slight, swell low (SW), $S_{1_0}$. Rain. |
| | Puri . | 19 | WSW | 7 | $S_7$, Rain shower. |
| | Puri . | 23 | SW | 9 | $S_{1_0}$, Rain squall. |
| | Chandbali | 17 | NNW | 3 | $K_5$, $AK_1$. Drizzle. |
| | Chandbali | 19 | SSW | 7 | $N_{1_0}$, Rain squall. |
| | Chandbali | 23 | S | 6 | $K_6$, $CS_2$, Squally. |
| | Balasore . | 17 | E | 4 | $N_{1_0}$, Drizzle. |
| | Balasore . | 19 | E | 3 | $N_{1_0}$, Rain. |
| | Balasore . | 23 | SE | 4 | $N_{1_0}$, Rain. |

The storm had passed well inland by 23 hours of the 3rd and was centred about 60 miles to the north-west of Chandbali. At 23 hours practically all the stations between Puri and Calcutta reported thunder-rain and squalls.

Extract from the weather diary of Puri, Chandbali and Balasore meteorological observatories is given below. It throws light on the weather experienced along the Orissa coast between the 2nd and the 4th.

| Station. | 2nd August. | 3rd August. | 4th August. |
|---|---|---|---|
| Puri . . . | .... | Light to moderate drizzles or rain continued occasionally from midnight till 8 hours. At 8 hours light rain with sky overcast gloomy. Slight continuous rain from 8 hours till midnight and wind changed to SSW from 21 hours when the force gradually increased. | Gale winds from 23 hours till 8 hours and slight continuous rain from midnight till 8 A.M. At 8 hours gale winds. Sky overcast and sandstorm. Gale was blowing throughout day till 20 hours with light occasional drizzles from 8 to 12 noon. Sky was nearly overcast. |
| Chandbali . . | Calm till 1 hour slight drizzling 02-15. Lightning seen 01-00—02-30 slight rain with moderate breeze till 03-30, light breeze till 08-30, gentle breeze till 15-30, thunder heard 12-30—15-00. Thunderstorm with heavy rain till 16-45. Slight rain with thunderstorm till 19-00. Moderate breeze till 20-00 hours. | Rain intermittently till 07-00. Heavy rain intermittently till 08-10. Squally slightly 05-30 to 06-00 and intermittently till 17-00. *Heavy squalls with rain 18-00—19-30 and squalls with slight and drizzling rain till midnight.* | Squalls with drizzling rain till 08-00. Strong breeze intermittently all day till 21-00. Sky variable. Drizzling at 10-30, cloud decreasing till 21-00. |
| Balasore . . | .... | Whole day sky overcast. Drizzling and rain showers since early morning. Wind and rain began to increase and *weather became worse and worse with progress of day. From 8 p.m. to 11-30 p.m. the wind became so high that no one could get out.* | Whole day sky mainly overcast. Slight drizzle from 7-30 A.M. to 8-30 A.M. followed by moderate rain showers up to 9 A.M. The sky gradually cleared after 8 P.M. |

By the morning of the 4th the storm had weakened and lay as a deep depression near Sambalpur in Orissa. Moving northwestwards, the depression was centred near Saugor in the west Central Provinces on the 5th, over Jaipur on the 6th, near Bikaner on the 7th and over the southwest Punjab and the adjoining districts of west Rajputana on the 8th. Thereafter it merged into and accentuated the seasonal low pressure area over north Baluchistan.

The disturbance was responsible for widespread rain along and near its track, rainfall being locally heavy in Orissa, the Central Provinces, Gujarat, Central India, Rajputana and on the Western Ghats.

The heavy rain according to newspaper reports caused much damage to crops and property in some of the areas through which it passed. Severe floods occurred in the Cuttack district of Orissa during which loss of life is reported. Some extracts from newspapers in this connection are given below :—

(*a*) *Statesman* of 6th August, 1933—

" RIVERS IN FLOOD.

*Many houses collapse at Cuttack.*

Cuttack, August 4.

Many thatched houses and brick and mud walls have collapsed as a result of heavy rains in the past 36 hours. The shower is believed to be the heaviest witnessed for a long time. Roads are impassable and tanks and wells are overflowing.

Local rivers, too, are in flood and the current in the Cathjury is so strong that the embankment appears to be in danger."

" RAIL LINE DAMAGED.

*Service suspended on B.-N. Railway section.*

Titilagarh (B. N. Railway), August 5.

Due to continuously heavy rain the line between Ambododala and Muniguda on the Raipur-Vizianagram line of the Bengal-Nagpur Railway was slightly damaged and through running of trains has been suspended since last night. Transhipment is not possible.

If weather conditions are favourable it is hoped to resume through running during the next 48 hours."

(*b*) *Amrita Bazar Patrika* of 8th August, 1933—

" CUTTACK VILLAGES IN FLOOD.

*River Rising.*

Woeful tale of homeless hundreds.

Cuttack, August 7.

*Flood Rising.*

The town of Cuttack having a population of 65,000 is facing a grave danger. During the three days—2nd, 3rd and 4th instants there was thirteen inches of rain. The rivers Mahanadi and Kathjuri are rising rapidly. At 12 A.M. (yesterday) the Kathjuri has risen upto 27·25 feet and messages from Sambalpur say that there is every likelihood of the flood rising still more by one or two feet. The whole town is panic-stricken.

*Houses Collapse.*

Due to these heavy rains about one-fourth of the whole of the town is still submerged under water ; about 500 houses have collapsed ; nearly 1,000 people are now receiving help.

*Floods in the neighbourhood of Cuttack.*

About one hundred and fifty villages to the south of the Kathjuri river are now under water. Serious breaches have occurred on the south bank of the Kathjuri and Kaukhais. Hundreds of people are taking shelter on the railway line. Some villages have been completely washed away."

(*c*) *Advance* of 8th August, 1933—

" INCESSANT RAIN.

*Many house-collapses at Cuttack.*

Cuttack, August 4.

Incessant rain since Wednesday last exacted a heavy toll of house-collapses in Cuttack town and suburbs. The rain has been general all over Orissa. Thousands of men, women and children have become homeless. The sky is heavily clouded. Telegraph lines have been damaged by heavy storm. The Up Puri Express was detained nearly for two hours at Barang Station. A goods train had to stop on the way near Jenapur as it could not run against the hostile wind.

It is reported that this sort of heavy downpour was not experienced during the last decade."

Floods are also reported to have occurred in the Sangli State and the Nasik district on account of heavy rain, the basins of the Krishna and Godavari rivers and loss of life on account of floods is also reported in the Nander district of Hyderabad.

Some of the noteworthy falls of 5″ and above recorded at stations during the period are noted below :

| Station. | 1st. | 2nd. | 3rd. | 4th. | 5th. | 6th. | 7th. | 8th. |
|---|---|---|---|---|---|---|---|---|
| | " | " | " | " | " | " | " | " |
| Sandoway | 7 | 14 | .. | 7 | .. | .. | .. | .. |
| Gwa | 5 | .. | 5 | .. | .. | .. | .. | .. |
| Veraval | .. | 11 | 7 | .. | .. | .. | .. | .. |
| Chanda | 6 | .. | .. | .. | .. | .. | .. | .. |
| Dharampur | .. | .. | .. | 9 | .. | .. | .. | .. |
| Pachmarhi | 6 | .. | .. | .. | 5 | .. | .. | .. |
| Cuttack | .. | .. | .. | 13 | .. | .. | .. | .. |
| Raipur | .. | .. | .. | 5 | .. | .. | .. | .. |
| Mahabaleshwar | .. | 10 | 10 | 12 | 13 | .. | .. | .. |
| Khandala | .. | .. | .. | .. | 11 | .. | .. | .. |
| Abu Road | .. | .. | .. | .. | .. | .. | 5 | .. |

| Station. | 1st. | 2nd. | 3rd. | 4th. | 5th. | 6th. | 7th. | 8th. |
|---|---|---|---|---|---|---|---|---|
| Dwarka | .. | .. | .. | .. | .. | .. | 12 | .. |
| Ajmer | .. | .. | .. | .. | .. | .. | 6 | .. |
| Bikaner | .. | .. | .. | .. | .. | .. | .. | 5 |
| Neemuch | .. | .. | .. | .. | .. | 5 | .. | .. |
| Harral | .. | .. | .. | 7 | .. | .. | .. | .. |
| Lakhandon | .. | .. | .. | 9 | .. | .. | .. | .. |
| Bap | .. | .. | .. | .. | .. | .. | 11 | .. |
| Kishengarh | .. | .. | .. | .. | .. | .. | 7 | .. |
| Nokh | .. | .. | .. | .. | .. | .. | 7 | .. |
| Gajner | .. | .. | .. | .. | .. | 10 | .. | .. |
| Palava | .. | .. | .. | .. | .. | 10 | .. | .. |
| Kishengan] | .. | .. | .. | .. | 7 | .. | .. | .. |
| Jawad | .. | .. | .. | 7 | .. | .. | .. | .. |

14. *Deep depression of 7th-9th August, 1933.*—On the morning of the 6th pressure has fallen markedly over Burma, and nearly general light to moderate rain had occurred over the province with locally heavy falls. Amherst and Diamond Island each had 6″. This suggested that a low pressure wave was travelling rapidly westwards across Burma into the Bay of Bengal. During the course of the day pressure fell further over Burma and next morning a trough of low pressure extended from Diamond Island to Saugor Island. By this time negative pressure changes and departures had concentrated over the east central Bay off the south Arakan coast, where conditions became markedly unsettled and appeared favourable for the formation of a depression. During the previous 24 hours the rainfall had been widespread and locally heavy in Pegu and Tenasserim and along the Arakan coast, Diamond Island reporting 4″ and Sandoway 6″. By the afternoon of the 7th, these unsettled conditions intensified further and a depression had formed with central region within a degree of Lat. 17° N., Long. 92° E. During the course of the night the depression rapidly deepened and moved in a northwesterly direction. Under its influence wind at Diamond Island which was southwesterly, force 4, at 17 hours became westsouthwesterly, force 8, at 19 hours and the rainfall, which was till 17 hours mainly confined to south Arakan coast and Tenasserim coast, extended to the north Arakan and Chittagong coasts during night.

On the morning of the 8th it was centred as a deep depression within half a degree of Lat. 18½° N., Long. 90½° E. The monsoon winds were strong to the south of latitude 18° and during the previous 24 hours widespread and locally heavy rain had fallen in Lower Burma, Amherst reporting 6″; the monsoon was also strong in southwest Bengal, Bihar and Orissa, the north Madras coast and Malabar.

During the course of the day the depression continuing to move in a northwesterly direction intensified still further and was centred at 17 hours within a degree of Lat. 19½° N., Long. 89½° E. At this stage the cyclonic circulation in the upper air had established itself upto at least 3 Km. height. Winds along the Arakan coast had generally strengthened and were squally. The following is an extract from the weather diary of the Meteorological Observer, Akyab :—

"*8th August, 1933.*—From 06-50 wind became squally. It gradually increased in intensity, at about 08-00 hours squalls were vigorous force of occasional gusts was 30 to 40 miles per hour. Direction was generally ESE. It changed to SE by noon and continued as such till 15-20 hours. Wind was then gradually decreasing in strength. After 15-20 hours squalls ceased but continuous southeasterly winds of moderate force (15 to 20 miles per hour) continued from 16-15 hours wind became again vigorously squally direction remaining unchanged. Squalls continued till 18-00 hours after which it was very slightly decreasing in strength. After sunset, intensity of squalls increased again and continued till midnight. Direction of wind which was southeasterly till 20-00 hours changed to SSE by midnight. At about 21-30 hours maximum force of a gust of the squalls rose to about 50 miles per hour and lasted for about 2 minutes. In the day time also, several gusts were of the order of 40-50 miles per hour."

Extracts from the logs of *S. S. Hosang* which moved in the wake of this depression are given below. It will be seen that in the early stages of the formation of this depression *Hosang* reported winds of force 8.

| Date. | Steamer. | Hour. | Position. | | Wind. | | Sea. | Swell. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|
| | | | Lat. N. | Long. E. | Dir. | Force. | | | |
| | | | ° ′ | ° ′ | | | | | |
| 7th August | "Hosang" | 03-50 | 14 5 | 93 3 | WSW | 8 | Rough | .... | Drizzle. |
| | "Hosang" | 06-30 | 14 9 | 93 0 | WSW | 8 | Very rough | Heavy, W. | |
| | "Hosang" | 10-00 | 15 2 | 92 7 | WSW | 8 | Very high | Heavy, SW | Rainsquall. |
| 8th August | "Hosang" | 03-30 | 17 0 | 91 1 | WSW | 6 | Rough | Heavy, W | Rainshower. |
| | "Hosang" | 06-30 | 17 3 | 91 0 | WSW | 6 | Rough | Moderate, W | Rain. |
| | "Hosang" | 10-00 | 17 8 | 91 0 | NW | 3 | Moderate | Moderate, W | Rain. |
| | "Hosang" | 17-30 | 18 6 | 90 1 | WSW | 5 | Moderate | Moderate, W. | |
| | "Hosang" | 21-30 | 18 3 | 90 3 | SW/W | 4 | Moderate | Moderate, SW. | |
| 9th August | "Hosang" | 02-00 | 20 0 | 89 0 | SSW | 3 | Moderate | Low, SW. | |
| | "Hosang" | 06-30 | 20 5 | 88 7 | SSW | 3 | Slight | Low, SW. | |

At 23 hours of the 8th the deep depression was centred about 120 miles southeast of Chandbali. Moving rapidly in a northwesterly direction it crossed the Orissa coast near Chandbali on the morning of the 9th. It took a westnorthwesterly course over land and was centred near Raipur on the 10th morning and over west Central India and Gujarat on the 11th. Thereafter it weakened and merged into the seasonal trough of low pressure over northwest India.

This depression was responsible for widespread rain along and near its track, rainfall being very heavy in Gujarat on the 8th, 9th and 10th. Locally heavy rain also occurred in Lower Burma on the 5th, 6th and 7th and in Orissa on the 8th. Heavy rain in connection with this depression caused, according to newspaper reports, severe floods in the Vishvamitri and Narbada rivers. It is reported that considerable damage was done to crops and property in Broach, Kaira and Ahmedabad districts as a result of these floods. Some of the noteworthy falls of 5″ and above are noted below :—

| Station. | 6th. | 7th. | 8th. | 9th. | 10th. | 11th. | 12th. |
|---|---|---|---|---|---|---|---|
| | ″ | ″ | ″ | ″ | ″ | ″ | ″ |
| Amherst | 6 | .. | 6 | .. | .. | .. | .. |
| Diamond Island | 6 | .. | .. | .. | .. | .. | .. |
| Sandoway | .. | 6 | .. | .. | .. | .. | .. |
| Kanpetlet | .. | .. | .. | 6 | .. | .. | .. |
| Puri | .. | .. | .. | 6 | .. | .. | .. |
| Chandbali | .. | .. | .. | 5 | .. | .. | .. |
| Pachmarhi | .. | .. | .. | .. | 10 | .. | .. |
| Cherrapunji | .. | .. | .. | .. | .. | .. | 11 |
| Waghai | .. | .. | .. | .. | 7 | .. | .. |
| Kaira | .. | .. | .. | .. | 7 | 9 | .. |
| Mehmedabad | .. | .. | .. | .. | 14 | .. | .. |
| Matar | .. | .. | .. | .. | 10 | .. | .. |
| Nadiad | .. | .. | .. | .. | 7 | 7 | .. |
| Godhra | .. | .. | .. | .. | 8 | .. | .. |
| Kalol | .. | .. | .. | .. | 10 | .. | .. |
| Halol | .. | .. | .. | .. | 8 | .. | .. |
| Dohad | .. | .. | .. | .. | 11 | .. | .. |
| Ahmedabad | .. | .. | .. | .. | 5 | .. | .. |
| Rambapur | .. | .. | .. | 8 | .. | .. | .. |

15. *Low pressure area off Kanara between 21st-23rd August, 1933.*—The monsoon weakened in the Peninsula and in and around the central parts of the country towards the end of the second week of August and pressure was generally higher than usual over the belt extending from Gujarat to Upper Burma. It began to strengthen in Malabar on the 16th and extended upto north Kanara by the 20th. Amini Devi had 3″ of rain on the 21st, the wind at that station having backed to W. (force 7) by 8 hours on the 22nd from NNW (force 6) on the previous day. Pressure also fell in the west Deccan and along and off Kanara and the Konkan on the 21st and a low pressure area appeared off north Kanara on the 22nd morning. Upper winds at Mangalore which were from NW upto 2 Km. on the 21st had also backed and were blowing from a southeasterly to southerly direction on the 22nd morning while those at Bombay and Poona which were coming from NW upto 1·5 Km. had during the same time veered to north or northeast. The low pressure area persisted off north Kanara during the next 36 hours and filled up thereafter. It was responsible for fairly widespread thundershowers in the west of the Peninsula.

16. *Shallow land depression between 21st and 27th August, 1933.*—The Bay monsoon strengthened after the 15th and widespread and locally heavy rain occurred in Assam and Bengal between the 15th and 20th. With the westward deflection of this current a shallow land depression appeared over Bihar on the 21st morning, the cyclonic circulation extending in the upper air at least upto a height of 3 Km. on that day. The depression moved slowly westnorthwestwards and was practically stationary near Allahabad between the 23rd and 24th. Thereafter it moved northwestwards to the southeast Punjab where it filled up on the 28th. This depression caused strong monsoon along and near its track and revived it in the central parts of the country and the north of the Peninsula.

17. *Depression in the east Arabian Sea between the 5th and 15th September, 1933.*—The monsoon was strong in the southeast Arabian Sea and in the south of the Peninsula in the beginning of September ; Amini Devi had 5″ of rain on the 1st, having also recorded 4″ on the previous day. Pressure was higher than usual over and around the centre of the country at the beginning of the month so that it was relatively low along and off Malabar. A general strengthening of the monsoon took place in the south of the Indian area on the 4th, and a low pressure area appeared off north Kanara on the 5th morning. The low pressure area persisted off north Konkan till the 9th when pressure fell along and off Konkan-Kathiawar coast and a depression appeared off the Bombay coast on the 9th morning with centre almost 75 miles to the west of Bombay. The upper winds at Bombay and Poona had also come under the influence of this depression off Bombay on the 10th morning ; at Bombay the wind at 0·5 Km. (the limit of pilot balloon ascent) was coming from southeast (force 6) and stratus cloud was from south, while at Poona the wind at 1 Km. was from south (force 2) and at 1·5 Km. (limit of pilot balloon ascent) from southwest (force 4). The pressure departure near the centre of the depression on the 10th morning must have been at least 0·25″.

The depression moved westnorthwestwards and was centred about 75 miles to the southeast of Veraval on the 11th morning. The activity of the monsoon in Gujarat was however less marked on the 10th than on the 9th and it indicated a possible weakening of the depression. This was probably due to the northwestward movement of a depression from the Bay which was approaching north Hyderabad on the 11th morning, the upper winds over the northwest of the Peninsula having come under the influence of this depression by that evening. By the 12th morning both the depressions, the one in the Arabian Sea off Veraval and the one near Hyderabad Deccan, had weakened. The low pressure area off Kathiawar persisted there till the 15th. After this the weather in and around the northwest of the Peninsula was controlled by a fresh depression from the Bay of Bengal which had moved northwestwards and lay slightly to the east of Kotah in east Rajputana on the 16th morning.

This Arabian Sea depression was responsible for widespread and locally heavy rain in the western half of the Peninsula including Gujarat.

18. *Depression of 6th-12th September, 1933.*—On the morning of the 5th, the weather charts indicated that :—

1. The monsoon was strengthening to the south of latitude 12°N.
2. The pressure distribution over north and central Bay was flat.
3. The pressure was appreciably below normal practically over the whole of the central and south Bay.
4. A feeble cyclonic circulation existed in the Bay off the Orissa-Circars coast as seen from the ships' observations given below :—

| Date. | Steamer. | Hour. | Position. | | | | Wind. | |
|---|---|---|---|---|---|---|---|---|
| | | | Lat. N. | | Long. E. | | Dir. | Force. |
| | | | ° | ′ | ° | ′ | | |
| 5th September | Alice Moller . . | 08-00 | 15 | 4 | 84 | 9 | SW | 3 |
| | Suisang . . | 06-30 | 18 | 6 | 89 | 8 | SW | 2 |
| | | 08-00 | 18 | 8 | 89 | 8 | SW | 2 |
| | Himalay Maru . | 08-00 | 20 | 4 | 90 | 6 | S | 3 |
| | Chyebassa . . | 06-30 | 19 | 2 | 87 | 3 | NE | 1 |
| | | 08-00 | 19 | 4 | 87 | 3 | E | 1 |
| | City of Darby . | 08-00 | 18 | 4 | 84 | 9 | ENE | 1 |

The cyclonic circulation had also established itself over the north and central Bay upto a height of 4 Km.

These facts suggested that conditions were becoming favourable for the formation of a depression off the Circars coast. During the course of the day the unsettled conditions became more marked and by the next morning a shallow depression had formed with central region within a degree of Lat. 16½°N., Long. 87°E.

The depression moved slowly in a westerly direction without showing any signs of intensification and was centred next morning (*i.e.*, 7th) within half a degree of Lat. 16½°N., Long. 85½°E. Thereafter it took a north westerly course and was centred at 17 hours within half a degree of Lat. 17°N. and Long. 85°E.

It continued to move slowly in a northwesterly direction and was centred about 80 miles southeast of Calingapatam on the morning of the 8th and by 17 hours of that day it lay with its centre very close to Calingapatam. During the course of the next 36 hours it remained practically stationary with its central region very close to the coast between Calingapatam and Cocanada. By the early morning of the 10th it crossed the Circars coast to the south of Calingapatam and was centred at 8 hours near Jagdalpur in the east Central Provinces. Moving further in a northwesterly direction it lay near Chanda on the morning of the 11th. Thereafter it weakened and filled up over the west Central Provinces on the 12th. It caused widespread rain in the north of the Peninsula and the central parts of the country, with locally heavy falls to the south of its track.

19. *Shallow depression of 12th-19th September, 1933.*—On the afternoon of the 11th, pressure fell over the northwest angle of the Bay and along the coastal districts of Orissa. By 8 hrs. of the next morning a shallow depression of small extent formed in the northwest angle of the Bay with central region very near the coast between Puri and Chandbali. Without showing any signs of intensification it passed inland by the evening of the 12th and lay over the east Central Provinces on the 13th morning. Moving in a northwesterly direction it was centred slightly to the north of Nagpur on the 14th and near Bhopal on the 15th. It then moved practically northwards and was centred near Kotah on the 16th and 17th, near Jaipur on the 18th and near Hissar on the 19th, and broke up against Simla hills thereafter. It caused strong monsoon with locally heavy rain along and near its track in the Central Provinces, west Central India, east Rajputana, the Punjab and the west United Provinces. The monsoon also strengthened in Gujarat, the north Bombay Deccan and the Konkan between the 15th and 18th and extended into the North-West Frontier Province on the 17th and in the south-west Punjab during the 17th and 18th. Some of the heavy falls of 5″ and above during the course of this depression were :—

| Stations. | 13th. | 14th. | 15th. | 16th. | 17th. | 18th. | 19th |
|---|---|---|---|---|---|---|---|
| | ″ | ″ | ″ | ″ | ″ | ″ | ″ |
| Nagpur . . . . . | 6 | .. | .. | .. | .. | .. | .. |
| Raipur . . . . . | 5 | .. | .. | .. | .. | .. | .. |
| Amraoti . . . . . | .. | 7 | .. | .. | .. | .. | .. |
| Khandwa . . . . . | .. | 6 | .. | .. | .. | .. | .. |
| Indore . . . . . | .. | .. | 6 | .. | .. | .. | .. |
| Delhi . . . . . | .. | .. | .. | .. | 6 | .. | .. |
| Ambala . . . . . | .. | .. | .. | .. | .. | 6 | 6 |
| Dharampore . . . . | .. | .. | .. | .. | .. | .. | 6 |

20. *Storm of 17th-21st September, 1933.*—On the morning of the 14th a marked fall of pressure was noticed over Burma, while widespread light to moderate rain was reported from Lower Burma with a heavy fall of 5″ at Tavoy. In the upper air a "low" existed over central parts of Burma upto a height of 2 Kms. These facts suggested that a low pressure wave from the east was travelling across Burma.

During the course of the day pressure fell further over the province and another heavy fall of 6″ was recorded at Tavoy between 8 hrs. of the 14th and 15th ; rainfall had also extended further along the Chittagong-Arakan coast and south-east Bengal.

Some more heavy falls, including 7″ at Tavoy and 5″ at Amherst, occurred during next 24 hours ending at 8 hours of the 16th and pressure had fallen further in central Burma and in the Bay off the Arakan coast on the 15th. A shallow low pressure area lay over central Burma and the east Bay off the Arakan coast on the 16th morning. The monsoon was strengthening to the south of latitude fifteen while the observations from the coastal stations and ships showed that a feeble cyclonic circulation was being established over the east Bay off the Arakan coast.

During the course of the 16th, pressure fell still further over the north and central Bay and signs were noticeable of a depression forming off the south Arakan coast. By 8 hours of the same day a shallow depression had formed in the east central Bay with central region within a degree of Lat. 17°N., Long. 93°E. as shown by the following observations from ships and from some coastal stations.

| Date. | Steamer or Station. | Hour. | Position. | | Wind. | | Remarks. |
|---|---|---|---|---|---|---|---|
| | | | Lat. N. | Long. E. | Dir. | Force. | |
| | | | ° ′ | ° ′ | | | |
| 17th September | "Gairsoppa" | 8 | 19 3 | 92 6 | E | 2 | o, q. |
| | Sandoway | 8 | .. | .. | ENE | 1 | |
| | Gwa | 8 | .. | .. | SSE | 2 | |
| | Bassein | 8 | .. | .. | SSW | 1 | |
| | Diamond Island | 8 | .. | .. | SSW | 2 | |
| | "Jaladurga" | 8 | 15 8 | 93 4 | S | 2 | |
| | "Karagola" | 6-30 | 16 0 | 93 7 | NW | 2 | |

In the upper air the cyclonic circulation over the north and central Bay had extended up to about 4 Km. height.

The depression intensified rapidly during the course of that day without showing any signs of movement. Most of the ships which were in the disturbed area reported a negative barometric tendency of ·09″ between 15-30 and 17-30 hours of the 17th indicating thereby that pressure was falling rapidly over the region and the depression was deepening.

After 17 hrs. of the 17th the depression took a northwesterly course intensifying at the same time and was centred on the morning of the 18th within half a degree Lat. 18°N., Long. 92°E. At this stage pressure departure near its centre was of the order of —·03″. Under its influence the monsoon had strengthened in the south of latitude 18°N. In the upper air westerly or southwesterly winds of force 8, 10. and 11 were reported from Port Blair at 0·5, 1·0 and 1·5 Km. respectively.

The deep depression intensified still further and became a storm by the evening of the 18th with centre within half a degree of Lat. 18½°N., Long. 91½°E. Rough or moderate seas and continuous rain or drizzle were reported by most of the ships to the west and south of the disturbed area. Pressure departure near the centre of the storm was of the order of —0·35″ at this stage. Continuing to move slowly in a northwesterly direction, the storm was centred within half a degree of Lat. 19°N., Long. 91°E. on the morning of the 19th. Under its influence monsoon had been active in Burma and round the head of the Bay. The storm persisted along the same course and was centred about 80 miles to the southeast of Saugor Island on the morning of the 20th, after causing widespread rain round the head of the Bay with locally heavy falls along the Arakan-Chittagong coast.

Some observations from ships which were at one time or other within 100 miles of the storm-centre are given below. A study of the table will show that at no stage winds of storm or gale force were experienced near about the centre.

| Date. | Steamer. | Hour. | Position. | | Wind. | | Sea. | Swell. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|
| | | | Lat. N. | Long. E. | Dir. | Force. | | | |
| | | | ° ′ | ° ′ | | | | | |
| 18th September | "Karagola" | 15-30 | 20 1 | 89 1 | NE | 2 | Slight | Confused, SW. | |
| | "Suisang" | 17-30 | 18 4 | 89 7 | WNW | 4 | Rough | Moderate, W | Continuous moderate rain (Rain). |
| | "Chilka" | 17-30 | 17 1 | 90 6 | W | 6 | Rough | Moderate, SW | Drizzle (Drizzle). |
| 19th September | "Suisang" | 06-30 | 16 7 | 91 3 | SW | 7 | Very rough | Heavy, SW. | |
| | "Akita Maru" | 08-00 | 17 6 | 91 8 | WSW | 7 | .. | .. | Squall rain. |
| | "Ganges" | 08-00 | 19 2 | 89 8 | WNW | 5 | Moderate | Moderate, W | |
| | "Ganges" | 09-30 | 19 7 | 89 4 | NW | 2 | Slight | Confused, confused. | Rain (Rain). |
| | "Ganges" | 12-30 | 20 0 | 89 2 | NNW | 5 | Moderate | Low, SW | (Rain). |
| 20th September | "Ekma" | 01-30 | 20 4 | 88 9 | WNW | 5 | Moderate | Moderate, W | Continuous slight rain (Drizzle). |
| | "Ekma" | 05-30 | 19 7 | 89 6 | WSW | 5 | Moderate | Moderate, SW | Intermittent slight rain. (Shower). |

The following extracts from the logs of *S. S. Chilka* and *Sumatra Maru* which travelled through the disturbed area are also interesting:—

| Date. | Steamer. | Hour. | Position. | | Wind. | | Sea. | Remarks. |
|---|---|---|---|---|---|---|---|---|
| | | | Lat. N. | Long. E. | Dir. | Force. | | |
| | | | ° ′ | ° ′ | | | | |
| 17th September . | "Chilka" . . | Midnight | 18 3 | 87 2 | ESE | 4 | .. | 10-45 P.M. (I. S. T.) commenced raining with frequent heavy showers. Continuous lightning at night, commencing in eastwards moving towards NE and then passing over ship. |
| 18th September . | "Chilka" . . | 04-00 | 18 0 | 88 0 | WSW | 2 | .. | Lightning passed away to westwards. Continuous drizzle. |
| | | 08-00 | 17 7 | 88 8 | NW | 5 | .. | (Passing showers during watch). Overcast dull with tendency to brighten in NW. |
| | | 12-00 | 17 6 | 89 3 | NW | 5 | .. | (Fine since 8 A.M.) 11-30 drizzle commenced, overcast. |
| | | 14-00 | .. | .. | W/S | 5 | .. | Wind settled in W/S and slowly increasing. |
| | | 16-00 | 17 1 | 90 0 | W/S | 6 | .. | Occasional slight drizzle-dull overcast. |
| | "Sumatra Maru" . | 08-00 | 15 6 | 95 2 | SSW | 7 | High | Moderate gale, Squally. |
| | | 12-00 | 15 5 | 94 6 | SSW | 7 | High | Moderate gale, cloudy. |
| | | 16-00 | 15 8 | 94 2 | SW | 7 | High | Moderate gale, cloudy. |
| | | 20-00 | 16 1 | 93 9 | WSW | 7 | High | Moderate gale, overcast. |
| | | 24-00 | 16 4 | 93 5 | SW | 7 | High | Moderate gale, overcast. |
| 19th September . | "Sumatra Maru" . | 04-00 | 16 8 | 93 1 | SW | 7 | High | Moderate gale, overcast. |
| | | 08-00 | 17 1 | 92 8 | SW | 7 | High | Moderate gale, overcast. |
| | | 12-00 | 17 4 | 92 4 | SW | 7 | High | Moderate gale, overcast (Heavy rain squalls). |
| | | 16-00 | 17 7 | 92 0 | SW | 7 | High | Moderate gale, overcast (Heavy rain squalls). |
| | | 20-00 | 18 0 | 91 6 | SW | 7 | High | Moderate gale, overcast. |
| | | 24-00 | 18 3 | 91 2 | SW | 7 | High | Moderate gale, overcast. |
| 20th September . | "Sumatra Maru" . | 04-00 | 18 7 | 90 8 | SW | 7 | High | Moderate gale, cloudy. |
| | | 08-00 | 19 0 | 90 4 | SW | 7 | High | Cloudy (Heavy rainsqualls). |
| | | 12-00 | 19 3 | 90 0 | SW | 7 | High | Squally, cloudy. |
| | | 16-00 | 19 6 | 89 7 | SW | 7 | High | Cloudy. |
| | | 20-00 | 19 8 | 89 4 | SW | 6 | High | Cloudy. |
| | | 24-00 | 20 1 | 89 1 | SSW | 6 | High | Squally, cloudy. |

As the storm approached the Bengal coast the weather in the coastal districts of Orissa, Bengal and Chittagong deteriorated, and squalls accompanied by continuous rain and drizzle were experienced by several stations in Bengal

and Arakan coast. Extract from the logs of *L. V. Star* which plied in the Hooghly river is interesting in this connection.

| Hour. | Wind. | Force. | Weather. | Sky. | REMARKS. |
|---|---|---|---|---|---|
| | | | *19th September 1933.* | | |
| 2 | N | 3 | Dull | OC | A. M. weather dull and unsettled overcast with heavy showers. Noon weather the same. 20-10 hrs. T. S. with very heavy rain and vivid lightning lasted until 22-00 hrs. Mid-night weather squall and unsettled with rain and vivid lightning. |
| 4 | N | 3 | Squall | OCP | |
| 6 | N | 3 | Squall | OCP | |
| 8 | NW | 3 | Squall | OCP | |
| 10 | NW | 3 | Squall | OCP | |
| 12 | NW | 3 | Squall | OC | |
| 14 | NW | 2 | Dull | OC | |
| 16 | NW | 2 | Dull | OC | |
| 18 | W | 2 | Dull | OC | |
| 20 | SW | 3 | Squall | OCTLR | |
| 22 | NW | 1 | Squall | OCR | |
| 24 | NW | 2 | Squall | OCR | |
| | | | *20th September 1933.* | | |
| 2 | NW | 3 | Wet | OCR | A. M. weather dull wet and unsettled. Sunrise heavy squalls with heavy rain moderate sea and swell. Noon weather squall with rain. Sunset dense masses of wicked looking cloud all round the horizon. Mid-night weather squalls with rain heavy swell and sea. |
| 4 | W | 3 | Wet | OCR | |
| 6 | NW | 4-5 | Squall | OCTLR | |
| 8 | NW | 3 | Squall | OCR | |
| 10 | WNW | 3 | Squall | OCD | |
| 12 | WNW | 4-5 | Squall | OCR | |
| 14 | WNW | 5 | Squall | OCR | |
| 16 | W | 5 | Squall | OCR | |
| 18 | SSW | 4 | Squall | OCR | |
| 20 | SSW | 4-5 | Squall | OCR | |
| 22 | SW | 4-5 | Squall | OC | |
| 24 | SW | 5 | Squall | OCR | |

By the evening of the 20th the storm crossed coast near Saugor Island and caused very bad weather in southwest Bengal. The weather diary of the Calcutta and Midnapore observers for the 19th, 20th and 21st is given below :—

| Station. | 19th September. | 20th September. | 21st September. |
|---|---|---|---|
| Midnapore . | Unsettled weather with occasional rain or showers. | Very bad weather with rain or drizzle and occasional thunder and lightning with strong wind. | Bad weather with rain and drizzle upto noon and showers in evening, wind strong. |
| Calcutta . | .. | Sky was overcast all day long. Gusty weather in the morning. Squally weather at 14 hours which continued throughout. Intermittent drizzle and rain throughout day. | Squally weather in the early morning. Intermittent drizzle and rain throughout the day Heavy rain 14-53 to 15-23. |

On the morning of the 21st it lay as a deep depression over Chota Nagpur. Thereafter it continued to move northwestwards and was centred between Daltonganj and Pendra on the 22nd morning, near Umaria on the 23rd, near Nowgong on the 24th and between Jaipur and Agra on the 25th. Then it assumed a more northerly course and was located near Hissar on the morning of the 26th. After this it slowly filled up during the course of the next two days.

During the course of this disturbance the monsoon was strong in Lower Burma between the 13th and 20th, rainfall being locally heavy in Tenasserim and Pegu between the 13th and 17th and in Arakan on the 19th. The disturbance was also responsible for widespread and locally heavy rain in northeast India, the United Provinces, the central parts of the country and the eastern districts of Rajputana and the Punjab. Outside the area affected by this depression there was very little rain as the monsoon had begun to weaken towards the end of the 3rd week of September.

Heavy rain in the southeast Punjab and the Punjab-Kumaon hills in connection with this as well as the shallow depression of 12th-17th September was reported to have caused severe floods in the Jumna which resulted in considerable damage to property and cattle, especially in Rohtak and in the adjoining districts of southeast Punjab. Heavy rain in the Wardha district (C. P.) also caused floods in the Wana river as a result of which many houses collapsed, cotton crop was damaged and several cattle drowned.

Some of the heavy falls of 5″ and above during the course of this disturbance are noted below :—

| Station. | 14th. | 15th. | 16th. | 19th. | 20th. | 21st. | 22nd. | 23rd. | 24th. |
|---|---|---|---|---|---|---|---|---|---|
| | ″ | ″ | ″ | ″ | ″ | ″ | ″ | ″ | ″ |
| Tavoy . . | 5 | 6 | 7 | .. | .. | .. | .. | .. | .. |
| Ahmerst . . | .. | .. | 5 | .. | 5 | .. | .. | .. | .. |
| Sandoway . . | .. | .. | .. | 5 | .. | .. | .. | .. | .. |
| Kanpetlet . . | .. | .. | .. | 5 | .. | .. | .. | .. | .. |
| Akyab . . | .. | .. | .. | .. | 7 | 5 | 7 | .. | .. |
| Kyaukpyu . . | .. | .. | .. | .. | .. | 6 | .. | .. | .. |
| Sambalpur . . | .. | .. | .. | .. | .. | .. | 5 | .. | .. |
| Pachmarhi . . | .. | .. | .. | .. | .. | .. | 7 | .. | .. |
| Pendra . . | .. | .. | .. | .. | .. | .. | .. | 5 | .. |
| Umaria . . | .. | .. | .. | .. | .. | .. | .. | .. | 5 |
| Jubbulpur . . | .. | .. | .. | .. | .. | .. | .. | .. | 6 |
| Saugor Cantonment | .. | .. | .. | .. | .. | .. | .. | .. | 6 |

21. *Depression between the 12th and 19th October 1933.*— Conditions were unsettled in the southwest of the Bay of Bengal off the Coromandal coast after the 6th and fairly widespread thunderstorm rain occurred in south Madras between the 7th and 11th. With the westward movement of the unsettled conditions across the south of the Peninsula into the southeast Arabian Sea, a low pressure area appeared off Malabar on the 12th morning. Upper winds at Mangalore which were mainly easterly upto 2·5 Km. on the 11th had also veered to southeast by the next morning ; the upper winds at Trivandrum were not however under the influence of the low pressure area. Pressure fell in the neighbourhood of Amini Devi on the 12th and the low pressure area showed signs of concentration in that region on the next day ; in the meantime the upper winds at Mangalore had also strengthened and were coming from southeast with force 7 near about 0·5 Km. (limit of pilot balloon ascent) on the 13th morning. By the next day a shallow depression had formed in the east Arabian Sea off Kanara with centre about 150 miles to the northwest of Amini Devi ; the upper winds at Mangalore had also during this period veered to south.

In the next 24 hours the depression moved slightly westwards and intensified somewhat at the same time. The upper winds upto 4 Km. on the 16th morning were coming mainly from the south (force 3-7) at Mangalore and from the east (force 6-7) at Bombay. The depression persisted there apparently without any weakening for the next two days. Thereafter the winds in the west of the Peninsula came under the influence of a storm from the Bay of Bengal, which crossed the Circars coast between Masulipatam and Cocanada on the 18th morning, and the depression in the east Arabian Sea filled up rapidly by the 19th. Squally weather however continued in the southeast Arabian Sea along and off south Kanara on the 19th.

Rainfall continued to be widespread in south Madras till the 15th and also extended into the Konkan and the Bombay Deccan; between the 15th and 19th rainfall was confined to Malabar and neighbourhood.

22. *Storm of 13th-22nd October 1933.*—The influence of a low pressure wave travelling from the east was first noticeable in Lower Burma on the afternoon of the 10th. By the morning of the 11th pressure fell further over that region and during the course of the next 24 hours the low pressure wave had passed out into the Andaman Sea and nearly general intermittent light rain had occurred in Lower Burma. On the morning of the 12th a shallow low appeared over the Andaman Sea, while in the upper air a cyclonic circulation existed over that region up to a height of at least 2 Km. Rainsqualls were reported by *S. S. Sirdhana* (Lat. 14·4°N., Long. 93·2°E.) and *S. S. Tokushima* (Lat. 15·5°N., Long. 94·1°E.) which were situated between Diamond Island and Port Blair. These facts suggested that conditions were becoming unsettled over the Andaman Sea and neighbourhood.

The unsettled conditions intensified during the rest of the day, and developed into a shallow depression by the morning of the 13th, with central region in the neighbourhood of Lat. 11°N., Long. 92°E. The following ships' together with Port Blair observations indicated that a cyclonic circulation had established itself over the Andaman Sea and the southeast Bay.

| Date. | Station or Steamer. | Hour. | Position. | | Wind. | | Remarks. |
|---|---|---|---|---|---|---|---|
| | | | Lat. N. | Long. E. | Dir. | Force. | |
| | | | ° ′ | ° ′ | | | |
| 13th October . . | Port Blair . . | 08-00 | .. | .. | ESE | 1 | (Showers). |
| | "Rance" . . | 08-00 | 12 2 | 90 3 | ENE | 1—2 | |
| | "Garmula" . . | 06-30 | 11 6 | 89 5 | NNW | 2 | Drizzle (drizzle). |
| | | 08-00 | 9 2 | 86 1 | WNW | 3 | |
| | "Yorkshire" . | 05-30 | 11 3 | 88 9 | NNW | 3 | Shower of slight or moderate rain. (showers). |
| | "Hatipara" . . | 06-30 | 8 7 | 90 6 | SW | 3 | Precipitation within sight. (Rain). |
| | "Shropshire" . | 08-00 | 13 5 | 92 3 | E | 2 | Generally cloudy, passing showers. |

Moving slowly in a northwesterly direction the depression intensified gradually. Next morning (14th) it was centred within a degree of Lat. 13°N., Long. 90°E. By this time the cyclonic circulation round the centre of the depression had become more pronounced, while in the upper air the circulation had established itself over the Bay upto a height of at least 3 Kms. During the course of that day, the depression intensified further. Ships observations indicated that winds to the south west and north east of the centre of the depression had strengthened. At 19 hours when the depression was centred within a degree of Lat. 13½°, Long. 89°, strong winds were reported by Diamond Island and *S. S. Khandalla.*

| Date. | Steamer or Station. | Hour. | Position. | | Wind. | | Sea. | Remarks. |
|---|---|---|---|---|---|---|---|---|
| | | | Lat. N. | Long. E. | Dir. | Force. | | |
| | | | ° ′ | ° ′ | | | | |
| 14th October . . | "Khandalla" . | 17-30 | 17 9 | 91 4 | SE | 6 | Rough | Rain squalls. |
| | | 19-00 | 16 9 | 92 4 | ESE | 6 | Rough | |
| | Diamond Island . | 19-00 | .. | .. | ESE | 7 | Rough | |

The wind at Diamond Island was easterly force 5 at 8 hours of the 14th. With the intensification of the depression the wind veered and increased in force. Both at 19 hours and 23 hours Diamond Island reported southeasterly wind of force 7, although the centre of the disturbance was about 300 miles away. An extract from the weather diary of the meteorological observer at Diamond Island for 14th and 15th is given below :—

"*14th October 1933.*—0 to 18 hours sky mainly overcast. Heavy continuous rain between 1 and 6 hours then intermittent drizzles. Breeze fresh to strong from eastwards. Sea moderate. Swell average length, moderate height, from eastward. 18 to 0 hours variable sky. K N clouds on horizon W to N. Drizzle. Breeze moderate gale from ESE. Sea rough, swell average, length moderate, height from eastward.

*15th October 1933.*—0 to 16 hours sky mainly overcast. N and K N clouds. Intermittent heavy rain. Strong breeze from SE. Sea rough to moderate. Swell average, height moderate. 16 to 0 sky more or less clear. K N clouds on horizon. No rain. Breeze dropped to fresh. Sea moderate swell average, length, moderate, height from southeastward."

Continuing to move in a northwesterly direction, the deep depression lay with centre within a degree of Lat. 14°N., Long. 88°E. on the 15th morning when the pressure departure near the centre was of the order of —0·25″. It continued to intensify throughout the day and by the evening of the 15th developed into a cyclonic storm with centre near Lat. 14½°N., Long. 87½°E. at 19 hours. By the afternoon of the 15th, the cyclonic circulation over the Bay had also further extended upto at least 4 Kms. height. Most of the ships between latitudes 9°N. and 18°N. and longitude 84°E. and 92°E. reported a negative barometric tendency of ·09″ and moderate or rough seas at 17 hours, suggesting thereby that pressure was falling rapidly over the disturbed area.

The following extracts from the log of *S. S. Jaladurga* of the Scindia Steam Navigation Company on her way from Rangoon to Gopalpur are interesting. The ship sailing in the northern quadrant of the storm followed more or less a parallel course to that of the storm.

| Date. | Hour. | Position. | | Wind. | | Weather at time of ovservation. | Sea. | Swell. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|
| | | Lat. N. | Long. E. | Dir. | Force. | | | | |
| | | ° ′ | ° ′ | | | | | | |
| 15th October . | Noon | 16 1 | 92 8 | SE | 4—5 | o, p, q, r . | Moderate | Low, confused. | Passing squalls of heavy rain. |
| | 4 P. M. | 16 5 | 92 1 | SE | 4—5 | o, p, q . . | Moderate | Low, SE | |
| | 8 P. M. | 16 8 | 91 2 | SE/E | 5 | o, q . . | Moderate | Low, SE | Occasional drizzle. |
| | Midnight | 17 1 | 90 4 | SE/E | 4 | o, q . . | Moderate | Low, SE | |

Remarks.—Wind increased at 5 A. M. on clearing the land—Low long confused swell. At 8 A.M. deep depression reported practically stationary within ½° of Lat. 14°N., Long. 89°E. ship thus in right hand rear quadrant of depression. Hence hourly observations started. Bar. falling very slowly. Wind steady at SE/S with a tendency to decrease towards Sunset.

| Date. | Hour. | Position. | | Wind. | | Weather at time of ovservation. | Sea. | Swell. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|
| | | Lat. N. | Long. E. | Dir. | Force. | | | | |
| | | ° ′ | ° ′ | | | | | | |
| 16th October . | 4 A. M. | 17 4 | 89 6 | SE | 4—5 | o . . . | Rough | Low, SE | |
| | 8 A. M. | 17 7 | 88 9 | .. | 5 | c, q . . | Rough | Moderate, SE, swell increasing. | |
| | Noon | 17 8 | 87 8 | SE | 6—7 | .. | Rough | Moderate, SE | |
| | 4 P. M. | 17 9 | 87 0 | S/E | 7 | c, q . . | Rough | Heavy, SE | 4·0 hove to heading S, watching progression of storm. |
| | 8 P. M. | 17 5 | 86 8 | .. | 4 | o, q, l . . | Rough | Moderate, SE. | 8·0 received message from Gopalpur to try and make port resumed course to Gopalpore. |
| | 12 P. M. | 18 1 | 86 2 | NE | 5 | o, q . . | Rough | Moderate, SE. | |

Remarks.—Wind increasing gradually from 7 A.M. At 8 A.M. cyclonic storm reported centred within ½° of Lat. 15½°N., Long. 86½°E. moving in some NW'ly direction. Course was altered at 10 A.M. for Vizagapatam owing to the storm approaching the coast and thus making the landing of passengers not possible. Heavy rainsqualls commenced. Wind increased gradually till 4 P.M. and the bar. continued to fall very slowly till 8 P.M. when ship resumed her course towards Gopalpur upon receipt of message to try and make port. Weather moderated as ship proceeded north. Wind backed to NE and increased to force 5 during a rainsquall at 11-15 P.M.

| Date. | Hour. | Position. | | Wind. | | Weather at time of observation. | Sea. | Swell. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|
| | | Lat. N. | Long. E. | Dir. | Force. | | | | |
| | | ° ′ | ° ′ | | | | | | |
| 17th October . | 4 A. M. | 18 8 | 85 6 | NE | 3—4 | l, c, p, q . . | Slight | Low, ESE | Continuous light rain. |
| | 8 A. M. | .. | .. | ENE | 6 | c, p, q . . | Rough | Moderate, ESE | |
| | Noon | 18 9 | 84 7 | SE/E | 6—5 | b, c, q . . | Rough | Moderate, E | |
| | 4 P. M. | 18 4 | 84 5 | E | 4 | o, q, r . . | Rough | Moderate, E | Continuous heavy rainsqualls. |
| | 8 P. M. | 18 1 | 84 4 | .. | 3 | .. | Rough | Moderate, ESE | |
| | Midnight | 18 0 | 84 0 | E/N | 5 | c, p . . | Rough | Moderate, E | |

Remarks.—At 2 A.M. storm reported centred within about 100 miles east of Vizagapatam. Weather moderated considerably. Bar. steady sky clearing. Wind increased at daylight but the bar. continued steady. The ship was anchored off Gopalpur from 7-15 to 10 A.M. Very rough sea and heavy surf near the coast. The sky cleared after leaving Gopalpur but precipitation was in sight. Ship arrived Baruva at 12-15 but proceeded at 12-45 being unable to land passengers owing to heavy surf. Proceeding to Bimlipatam the ship was kept well out to sea, the land being obscured by continuous heavy rainsqualls. The bar. commenced falling at 1 P.M. and heavy rainsqualls continued till 9 P.M. At midnight wind increased slightly and ship again experienced heavy rain and hard squalls as she proceeded south.

| Date. | Hour. | Position. | | Wind. | | Weather at time of observation. | Sea. | Swell. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|
| | | Lat. N. | Long. E. | Dir. | Force. | | | | |
| | | ° ′ | ° ′ | | | | | | |
| 18th October . | 4 A. M. | 17 6 | 83 4 | E | 4 | .. | Moderate | Moderate, ESE | |
| | 8 A. M. | 17 2 | 82 7 | E | 7 | o, p, q, l . . | Very rough. | Confused | 10·0 made Vakalapudi light ship having experienced SW'ly current 2½ running parallel to coast. Swell not perceptible owing to high sea. |
| | Noon | At Cocanada | | SE | 7/6 | o, q, r . . | Very rough | Not perceptible owing to high sea. | |

Remarks.—Vizagapatam light was made shortly after midnight, the ship having experienced a SW'ly set of 2½-3 knots setting parallel to the coast but the ship was hauled off as entering was considered unadvisable owing to stress of weather. Cruising to the Captain's orders heading for Cocanada. The bar. began to fall from 5 A.M. the swell was first confused latterly hardly perceptible owing to the high sea. The storm was reported to be crossing the coast between Masulipatam and Cocanada at 8 A.M. ship then about 30-50 miles north of the centre. Cross bearings of the land were obtained between 7 A.M. and arrival at Cocanada during short lulls in squalls which continued to hang over the land owing to the mountainous nature of the country. Wind veered gradually after the trough had passed the ship. At 10-19 A.M. anchored at Cocanada outer anchorage; the wind and sea moderated very rapidly between 2 and 4 P.M. when the ship proceeded to the usual anchorage. Sky cleared about 10 P.M.

Continuing to move in a northwesterly direction, the storm was centred next morning (16th) apparently within half a degree of Lat. 15°N., Long. 86¼°E. Ships nearest to the centre and in the southwest and northeast quadrant of the storm reported rough or very rough seas, rainsqualls and winds of force 5 or 6. Under its influence nearly general rain had occurred in Bengal, Orissa and the north Madras coast with a few heavy falls in southwest Bengal and Orissa during 24 hours ending at 8 hours of the 16th.

Observations from stations along Orissa, Circars, Coromandel coasts indicated that squalls began to be experienced along the coast after 11 hours of the 16th. At 14 hours the storm was centred within half a degree of Lat. 15¼°N., Long. 85¼°E. Thereafter it took up a more westerly course and was centred at 19 hours about 150 miles southeast of Vizagapatam.

The storm then began to move in a westnorthwesterly direction and was centred about 100 miles southeast of Cocanada on the morning of the 17th. During the previous 24 hours it had caused heavy falls of rain along Bengal, Orissa and north Circars coasts, Saugor Island reporting 13″.

Some very heavy squalls were experienced along Orissa-Circars coast between 11 hours and 19 hours of the 17th as given in the table below.

| Date. | Station. | Hour. | Direction. | Force. | Remarks. |
|---|---|---|---|---|---|
| 17th October. | Vizagapatam . | 11 | ENE | 9 | Gusty weather followed by a succession of sudden squalls. |
| | | 12 | NE | 9 | |
| | Cocanada . | 10 | N | 7 | Light wind followed by sudden squall. |
| | | 12 | NE | 6 | |
| | Puri . . | 18 | E | 8 | Gusty weather followed by a succession of sudden squalls. |

The weather remarks from Port Officers, Madras, Vizagapatam and Cocanada for 17th and 18th October are also interesting.

(*a*) *Madras.*

"*17th October 1933.*—The weather was cloudy and misty with drizzles at intervals between 2-5 and 4-5 A.M. and again between 5-26 and 5-59 P.M. The highest wind velocity was 30 m.p.h. at 3-20 A.M. direction WSW barometer dropped ·02″ in 24 hours."

"*18th October 1933.*—Weather was fine during the day and got cloudy and windy towards night. The highest wind velocity was 35 m.p.h. at 8-55 P.M. direction south. Barometer dropped ·02″ in 24 hours."

(*b*) *Vizagapatam.*

"*18th October 1933.*—13-35 hours. Cloudy with drizzling. Sea rough with swell. 22-00 hours. Cloudy, stormy winds, sea not visible."

(*c*) *Cocanada.*

"*17th October 1933.*—11-20 A.M. Sky overcast with N and AS clouds and occasional rain and showers continued, N and NNE winds blowing and winds becoming squally."

"*18th October 1933.*—6-00 A.M. Sky completely overcast with N and AS clouds and squally weather. 5-35 P.M. Sky completely clouded with N and AS clouds and S and SSW winds blowing and rough seas."

Continuing to move in a westnorthwesterly direction the storm was centred about 70 miles southeast of Cocanada at 14 hours of the 17th. Winds along Orissa-Circars coast strengthened and squally weather persisted. The wind at Cocanada which was northeasterly force 3 at 23 hours of the 17th strengthened to force 7 northeasterly at 2 hours of the 18th and to force 8 easterly at 5 hours and 8 hours of the 18th. The storm crossed the Circars coast between Cocanada and Masulipatam on the morning of the 18th, when pressure departure near the centre was of the order of —0·4″.

By 17 hours of the same day the storm was well inland centred about 100 miles to the west of Cocanada and had weakened. With the passing inland of the storm, strong monsoon and squally weather prevailed for a time off the Coromandel-Circars coast but weather moderated gradually afterwards.

On the morning of the 19th, it lay as a deep depression over north Hyderabad about 150 miles to the south of Nagpur. Thereafter the depression passed through the central parts of the country and weakening lay over the east United Provinces on the 21st and filled up there by the morning of the 22nd.

Under its influence, local rain occurred along the Burma coast and widespread rain in northeast India, the Peninsula, the central parts of the country and the United Provinces. Rainfall was locally heavy along the coast between Saugor Island and Masulipatam between the 15th and the 17th, Saugor Island reporting 13″ on the 17th. Locally heavy rain also occurred along and near the track of the depression on land, it being unusually heavy in the United Provinces and east Central India for the time of the year.

It is reported that floods on the river Tammeleree near Ellore caused damage to property. Considerable damage was also done to the rabi crops in the United Provinces. Some newspaper reports in this connection are given below :—

*Star of India, dated 20th October 1933.*

Floods in south India.

M. S. M. Railway Breached.

Bezwada, October 19.

"The line between Bhimodale and Badambudy on the Bezwada-Rajahmundry section of the M. & S. M. Railway is breached due to floods. Through communication is interrupted. Transhipment is not possible at present. Passenger traffic is being diverted *via* Gudivada, Bhimavaram and Nidadavole."

*Statesman of 24th October 1933.*

South India Floods.

Cocanada villages under water.

Cocanada, October 21.

Owing to the rising of the river Eleru due to heavy rains nearly half the villages in Cocanada taluk are under water. No loss of life is reported so far. The Samalkot canal bund has been breached.

The following table gives the noteworthy falls of 5″ or more which occurred during the course of the disturbance.

| Station. | 14th. | 16th. | 17th. | 18th. | 19th. | 20th. | 21th. |
|---|---|---|---|---|---|---|---|
| | ″ | ″ | ″ | ″ | ″ | ″ | ″ |
| Narasapuram | .. | .. | .. | 6 | .. | .. | .. |
| Kaikalur | .. | .. | .. | .. | 9 | .. | .. |
| Saugor Island | .. | .. | 13 | .. | .. | .. | .. |
| Canning Town | .. | .. | 6 | .. | .. | .. | .. |
| Contai | .. | 5 | 7 | .. | .. | .. | .. |
| Ramnagar | .. | 8 | .. | .. | .. | .. | .. |
| Jenka | .. | .. | 8 | .. | .. | .. | .. |
| Uluberia | 5 | .. | .. | .. | .. | .. | .. |
| Budge Budge | 5 | .. | .. | .. | .. | .. | .. |
| Sore | 5 | 5 | .. | .. | 5 | .. | .. |
| Balipal | .. | .. | 5 | .. | .. | .. | .. |
| Eram (Basudebpur) | .. | .. | .. | .. | 5 | .. | .. |
| Rambha | .. | .. | .. | 6 | .. | .. | .. |
| Narasannapeta | .. | .. | .. | 5 | .. | .. | .. |
| G. Udayagiri | .. | .. | .. | 6 | .. | .. | .. |
| Mohana | .. | .. | .. | 6 | .. | .. | .. |
| Yellamanchili | .. | .. | .. | 6 | .. | .. | .. |
| Talabada | .. | .. | .. | 5 | 6 | .. | .. |
| Lammasinghi | .. | .. | .. | 18 | .. | .. | .. |
| Goringa | .. | .. | .. | 5 | .. | .. | .. |
| Ramachandrapur | .. | .. | .. | 9 | .. | .. | .. |
| Alamuru | .. | .. | .. | 7 | .. | .. | .. |
| Kottapeta | .. | .. | .. | 6 | .. | .. | .. |
| Amalapuram | .. | .. | .. | 7 | .. | .. | .. |
| Mummidivaram | .. | .. | .. | 8 | .. | .. | .. |

| Station. | 14th. | 16th. | 17th. | 18th. | 19th. | 20th. | 24th. |
|---|---|---|---|---|---|---|---|
| | " | " | " | " | " | " | " |
| Polavaram | .. | .. | .. | .. | 10 | .. | .. |
| Chodavaram | .. | .. | .. | .. | 10 | .. | .. |
| Tadepalligudem | .. | .. | .. | .. | 5 | .. | .. |
| Tanuku | .. | .. | .. | 5 | .. | .. | .. |
| Moradabad | .. | .. | .. | .. | .. | 5 | .. |
| Shajahanpur | .. | .. | .. | .. | .. | .. | 5 |
| Puranpur | .. | .. | .. | .. | .. | .. | 5 |
| Naini Tal | .. | .. | .. | .. | .. | 7 | .. |

23. *Shallow depression of 3rd-13th November 1933.*—The appearance of a marked fall of pressure over Lower Burma and the Tenasserim on the morning of the 2nd November suggested that a low pressure wave was passing into the Andaman Sea from the east across Tenasserim. By the morning of the 3rd a shallow depression formed in the north Andaman Sea with central region in the neighbourhood of Lat. 14°N., Long. 97°E. The following observations from some of the coastal stations and ships indicated that a feeble cyclonic circulation existed over the Andaman Sea.

| Date. | Station or Steamer. | Hour. | Position. | | Wind. | | Sea. | Swell. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|
| | | | Lat. N. | Long. E. | Dir. | Force. | | | |
| | | | ° ′ | ° ′ | | | | | |
| 3rd November | Amherst | 08-00 | .. | .. | SSE | 2 | .. | .. | (Thunderstorm). |
| | Rangoon | 08-00 | .. | .. | N | 1 | .. | .. | |
| | "Karapara" | 05-30 | 13 5 | 96 8 | WSW | 2 | Slight | Low | Drizzle and rain. |
| | "Begum" | 06-30 | 14 3 | 96 4 | NNW | 3 | Slight | Low, SW | Rain, Thunderstorm |
| | "Begum" | 08-00 | 14 1 | 96 5 | NNW | 3 | .. | .. | |
| | "Warina" | 06-30 | 15 5 | 96 0 | NW | 3 | Slight | Low | Rain shower |
| | "Warina" | 08-00 | 15 5 | 95 9 | NW | 3 | Slight | Slight, NW | Overcast, passing showers. |
| | "Strathnaver" | 08-00 | 14 1 | 98 0 | SE/E | 5 | Moderate | Moderate, SE | Generally cloudy. |

By the 3rd afternoon rainfall extended along the north Tenasserim coast and in the Irrawady and Pegu divisions while the depression had apparently weakened and lay as a trough of low pressure over the north Andaman Sea.

During the night, however, the trough of low pressure again intensified into a depression which was centred near Lat. 15°N., Long. 96°E. on the morning of the 4th. Without any appreciable movement or intensification, the depression persisted over the Gulf of Martaban till the morning of the 5th when it weakened into a low pressure area, which lay over the Andaman Sea and neighbourhood on the morning of the 6th. In this connection local falls of rain occurred in Lower Burma from the 3rd to the 7th.

This low pressure area began moving slowly westwards and lay off the south Coramandel coast on the morning of the 8th, when the southerly winds in the southwest of the Bay had strengthened. It caused widespread and locally heavy rain in southeast Madras during the day, but no further intensification of the low pressure area took place.

The following remarks from the Port Officer, Madras are interesting :—

*10th November 1933.*—"The weather was cloudy, misty and windy, rain at intervals between 3-45 and 3-58 A.M. and again between 4-43 and 12-20 A.M. the following day. The highest velocity was 32 miles at 7-30 A.M. direction NNE. The barometer dropped ·06 in 24 hours. But on the 9th forenoon the Port experienced heavy rain accompanied by heavy thunder and lightning which continued from 1 A.M. to 4-22 A.M. The highest velocity of wind was 40 miles at 1-55 A.M. direction ENE."

The low pressure area passed across the south of the Peninsula into the southeast Arabian Sea by the morning of the 10th. It persisted there and caused unsettled weather in the southeast Arabian Sea off Malabar between the 10th and the 13th and became unimportant thereafter.

In this connection widespread and locally heavy rain occurred in southeast Madras on the 8th, 9th and 10th; rainfall also extended into Malabar, Mysore, the south Konkan and the west Deccan during that period. It is reported that heavy rain in the Tinnevelly district caused considerable damage to crops and property there; many parts of the district were heavily flooded and rail traffic was temporarily suspended.

The noteworthy falls of 5″ and above which occurred in southeast Madras are given in the table below :—

| Station. | 9th. | 10th. |
|---|---|---|
| | " | " |
| Kurinjipadi | 7 | .. |
| Manambadi (Porto Novo) | 9 | .. |
| Chidambaram | 7 | .. |

| Station. | 9th. | 10th. |
|---|---|---|
| | " | " |
| Mannargudi | 6 | .. |
| Srimushnam | 6 | .. |
| Shiyali | 5 | .. |
| Neidavasal | 6 | .. |
| Tranquebar | 7 | .. |
| Negapatam | 5 | .. |
| Tiruppundi | 7 | .. |
| Srivilliputtur | .. | 5 |
| Sivakasi | .. | 6 |
| Sattur | .. | 5 |
| Kayattar | .. | 7 |
| Kadayanallur | .. | 6 |
| Tenkasi | .. | 8 |
| Palamcottah | .. | 8 |
| Srivaikuntam | .. | 5 |

| Station. | 9th. | 10th. |
|---|---|---|
| | " | " |
| Tinnevelly | .. | 10 |
| Ayikkudi | .. | 7 |
| Shencottah (P. W. D. Office) | .. | 6 |
| Shencottah (Taluk Cutcherry) | .. | 6 |
| Tamarakulam (old salt factory) | .. | 5 |
| Tamarakulam (new salt factory) | .. | 6 |
| Pollachi | .. | 6 |

24. *Severe Storm of 14th-19th November 1933.*—The north-east monsoon freshened in southeast Bay and south Andaman Sea after the 10th November. Associated with this strengthening heavy falls of 3" occurred at Sabang both on the 11th as well as on the 12th. On the morning of the 13th a marked fall of pressure was noticed over the Andaman Sea and neighbourhood and the existence of a feeble cyclonic circulation over the region was indicated by the following observations from ships and Sabang.

| Date. | Steamer or Station. | Hour. | Position. | | Wind. | | Remarks. |
|---|---|---|---|---|---|---|---|
| | | | Lat. N. | Long. E. | Dir. | Force. | |
| | | | ° ′ | ° ′ | | | |
| 13th | Sabang | 08-00 | .. | .. | S | 3 | Squally 3 h. |
| | "Bengal Maru" | 08-00 | 5 6 | 96 2 | ESE | 4 | Generally cloudy and squally. |
| | "Rohna" | 06-30 | 6 6 | 92 2 | NE | 5 | Heavy rain. |
| | "Rawalpindi" | 08-00 | 5 9 | 90 6 | WNW | 5 | Overcast sky. |

These facts suggested that conditions were unsettled from the Andaman Sea to southeast Bay. This view was further supported by the existence of easterly or northeasterly winds of strong or gale force over Port Blair and Victoria Point upto about 2 Km. height.

| Stations. | 0·5 Km. | | 1 Km. | | 1·5 Km. | | 2 Km. | |
|---|---|---|---|---|---|---|---|---|
| | Force. | Dirn. | Force. | Dirn. | Force. | Dirn. | Force. | Dirn. |
| Port Blair | 6 | NNE | 7 | NE | 8 | ENE | 11 | NE |
| Victoria Point | 7 | E | 8 | E | 11 | E | .. | .. |

During the course of the day the unsettled conditions became more marked. Rain was reported by *S.S. Rohna* (Lat. 7-5°N., Long. 90-1°E.) both at 16-30 and 18-30 hours and by *S. S. Rajula* (Lat. 8-0°N., Long. 89-9°E.) at 18-30 hours. By early morning of the 14th, a depression formed in the Andaman Sea with central region within a degree of Lat. 9°N., Long. 94½°E. *S. S. Rajula* whose position at 01-30 hours was Lat. 7-5°N., Long. 91-2°E. reported moderate sea, continuous rain and negative barometric tendency of the order of 0·15" suggesting thereby that the pressure was falling rapidly in the neighbourhood of Car Nicobar. At 8 hours of the same day the depression had apparently

deepened and was centred within a degree of Lat. 9½°N., Long. 92°E. The cyclonic circulation over the Andaman Sea and adjoining parts of southeast Bay had become more marked as seen from the observations of the following ships and Port Blair.

| Date. | Steamer or Station. | Hour. | Position. | | Wind. | | Sea. | Remarks. |
|---|---|---|---|---|---|---|---|---|
| | | | Lat. N. | Long. E. | Dir. | Force. | | |
| | | | ° ′ | ° ′ | | | | |
| 14th . . | Port Blair . . . | .. | .. | .. | E | 4 | Rough . | Rain. |
| | "Rajula" . . . | 06-30 | 7 0 | 92 9 | WSW | 6 | V. Rough . | |
| | "Rohna" . . . | 05-30 | 8 1 | 88 2 | NNE | 5 | .. | |
| | "Sirsa" . . . | 06-30 | 11 9 | 89 6 | NE | 5 | .. | |
| | "Rajput" . . . | 08-00 | 12 0 | 89 9 | NE | 5 | .. | Overcast sky. Passing showers. |

Moving slowly westnorthwestwards, the deep depression continued to intensify during the course of the 14th. By the morning of the 15th it had developed into a storm centred within half a degree of Lat. 9½°N., Long. 90½°E. Port Blair surface wind which was eastsoutheasterly force 5 at 2 hours strengthened to force 7 at 8 hours of the 15th. In the upper air ESE wind of force 8 prevailed over Port Blair at 0·5 Km. (the limit of the pilot balloon flight).

The following extract from the weather diary of the meteorological observer, Port Blair, for 14th and 15th when the storm centre was within a distance of about 450 miles from the station throws some light on the early stages of development of the storm.

"*14th.*—There was variable light and heavy precipitation from 2-10 to 9-00 A.M. in the morning with intervals. KN and AS clouds were found in the morning. Nimbus also were found. Wind force 5 and 4 in Beaufort scale. Wind from East. Sea was rough; moderate swell. Afternoon there was rain from 1-10 P.M. to 7-18 P.M. Sea was very rough. Moderate swell. Nimbus were found. Moderate visibility and poor visibility at times. Generally stormy weather. Wind force 6 in the evening. Wind from ESE.

*15th.*—Stormy and dull weather during the day, rain from 12-10 to 12-35 and 4 to 4-5 A.M. and 10-25 to 10-40 A.M. Sea was very rough. High swell, wind force 7 and 6. Overcast. Nimbus were found. Wind from ESE. Afternoon rain from 1-20 to 1-30, 4 to 5-20, 7-20 to 7-30. Shower 10-15 to 10-20 P.M. Wind from SE, force 4 (Beaufort Scale). Sea was rough. Swell moderate."

The weather remarks of the Port Officer, Port Blair for that period are also of interest.

| Date. | Condition of weather. | State of sea. | Force of wind. | General direction. |
|---|---|---|---|---|
| 13th November . | Partly cloudy and indication of rain . . . . . | Rough . . . | Strong . . . | NE |
| 14th November . | Squally with rain . . . . . | V. Rough . . | Very strong . . | NE |
| 15th November . | Squally rain and weather suspicious . . . . . | V. Rough and boisterous. | Very strong . . | S, SE |
| 16th November . | Partly fair . . . . . | Slight to rough . | Moderate . . | S, SE |

The storm intensified further during its northwestward movement. *S. S. Hatimaru* which was on its way to Rangoon experienced rough seas and winds of force 8 while passing through the disturbed region. An extract from its logs for the 15th and 16th is given below:—

| Date. | Hour. | Position. | | Wind. | | Weather. | Sea. | Swell. |
|---|---|---|---|---|---|---|---|---|
| | | Lat. N. | Long. E. | Dir. | Force. | | | |
| | | ° ′ | ° ′ | | | | | |
| 15th November . | Noon | 10 34 | 87 55 | N/W | 7 | o, q | Rough . . . | Moderate, NE. |
| | 14-00 | 10 38 | 88 01 | N | 7—8 | .. | .... | .... |
| | 16-00 | 10 44 | 88 07 | N/W | 7—8 | o, r | Rough . . . | Moderate, NE |
| | 18-00 | 10 49 | 88 13 | W/S | 8 | .. | .... | .... |

| Date. | Hour. | Position. | | Wind. | | Weather. | Sea. | Swell. |
|---|---|---|---|---|---|---|---|---|
| | | Lat. N. | Long. E. | Dir. | Force. | | | |
| | | ° ′ | ° ′ | | | | | |
| 5th November . | 20-00 | 10 53 | 88 19 | W/S | 6—7 | q, o, r, g | High . . . . | Moderate, N. |
| | Midnight | 11 03 | 88 31 | SW/S | 6 | r, q, o | Rough . . . | Moderate. |
| 16th November . | 04-00 | 11 12 | 88 45 | SSE | 7 | o, r | Rough . . . | Moderate. |
| | 08-00 | 11 22 | 88 57 | SSE | 8 | o, r | High . . . . | Heavy. |
| | 10-00 | 11 26 | 89 03 | SSE | 8 | .. | .... | .... |
| | Noon | 11 31 | 89 10 | SSE | 7 | p | High . . . . | Heavy. |
| | 16-00 | 11 52 | 89 39 | S | 6 | o | Rough . . . | Moderate. |

As seen from the above, wind in the neighbourhood of the centre attained gale force by about 14 hours of the 15th and it lasted till 18 hours when the wind decreased in strength and changed direction. A further strengthening of wind to gale force took place between and 8 and 10 hours of the 16th.

The strong monsoon current to the east of the storm centre caused heavy rainfall in the Andamans on the 15th as well as on the 16th. The storm continuing to move in a westnorthwesterly direction was centred within half a degree of Lat. 10°N., Long. 87°E. on the morning of the 16th. After 8 hours winds along the Orissa, Circars and Coromandal coasts strengthened generally and squally weather and rough seas were experienced by ships and the stations particularly along the Circars and north Coromandal coasts. At 17 hours when the centre of the storm was within half a degree of Lat. 11°N., Long. 86°E. the upper air data show that the cyclonic circulation over the south and central Bay had extended upto at least 4 Km. height.

Pursuing a northwesterly course, the storm still further intensified and became severe by the morning of the 17th when its centre was near Lat. 14°N., Long. 83°E. Ships to the northwest and southwest of the storm centre attained winds of fresh or strong gale force. The following extracts from the logs of some ships which were within a distance of about 250 miles from the centre of the storm are interesting.

| Steamer. | Date. | Hour. | Position. | | Wind. | | Weather. | Sea. | Swell. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Lat. N. | Long. E. | Dir. | Force. | | | | |
| | | | ° ′ | ° ′ | | | | | | |
| " Jaladurga " . . | November 17. | 08-00 | Cocanada | | ENE | 8 | t, o, q, l | High . . | Confused . | Storm approching. |
| | | 20-00 | 17 20 | 83 30 | E/N | 6 | q, o, l, r | High to rough | Confused . | Wind and sea moderating. Bar rising rapidly. |
| " City of Venice " . | November 17. | 08-00 | 14 05 | 81 29 | NW/W | 8 | o, d | High . . | High. | |
| | | 20-00 | .. | .. | SE | 6 | o | Rough . . | .. | |
| " Cabarita " . . | November 17. | 01-00 | 13 08 | 81 0 | N | 6 | .. | .. | .. | |
| | | 04-00 | 13 08 | 81 40 | N | 8 | o, r | Rough . . | Moderate, NE | |
| | | 08-00 | 12 51 | 81 50 | W/N | 10 | r | High . . | Heavy, NE . | Fierce rain. |
| | | Noon | 12 46 | 82 48 | SW/W | 7 | .. | V. High . | .. | |
| | | 16-00 | 12 52 | 83 16 | SW | 7 | o | High . . | Heavy. | |
| Surada . . . | November 17. | 01-00 | 13 30 | 81 26 | NW | 9 | o, r | Rough . . | Heavy. | |
| | | 04-00 | 13 35 | 81 37 | NW | 10 | o, r | Rough . . | Heavy. | |
| | | 08-00 | 13 39 | 81 49 | WNW | 10 | o, r, q | High . . | High . . | Continuous rain, squally with hurricane force. |
| | | Noon | 13 48 | 82 13 | SW/W | 10 | o,r | High . . | High. | |
| | | 16-00 | 14 06 | 82 30 | S/W | 7 | o | Rough . . | Heavy . . | |

| Steamer. | Date. | Hour. | Position. Lat. N. | Position. Long. E. | Wind. Dir. | Wind. Force. | Weather. | Sea. | Swell. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | ° ′ | ° ′ | | | | | | |
| Nurjehan . . . | November 17. | 10-00 | 16 28 | 82 30 | ENE | 10 | o, r, q, u | .. | .. | Pyramidal sea, torrential rain. |
| | | Noon | 16 28 | 82 28 | SE | 9 | o, r, q, u | .. | .. | Pyramidal sea, heavy rain. Inst. kept on board. |
| | | 14-00 | 16 28 | 82 28 | SSE | 9 | o, r, q | .. | .. | Pyramidal sea, visibility 7 between squalls. |
| | | 18-00 | 16 26 | 82 28 | SE | 8 | c | Precipitous . | .. | |
| | | 20-00 | 16 36 | 82 33 | SE | 6 | c | High . . | Moderate. | |

From 6 A.M. to noon, 17th November 1933, a wind of force 10 from NE and ENE and finally SE was experienced by *S. S. Nurjehan*, with a precipitous pyramidal sea and very heavy SE swell. The barometer remained at 29·75″, temperature 81°F. and sky overcast with KN and scud which seemed to be flying at a very high speed. There were frequent rainsqualls from eastward with torrential rain, lasting in each case for about 20 minutes, the worst squalls being between 10 A.M. and noon. The sky cleared to the southeastward with a change of wind to SE at about noon and during the middle watch, from 2 P.M. to 4 P.M. the wind decreased leaving a high confused sea and very heavy swell from SE and the vessel was able to proceed. At midnight the wind was southeast, force 5 with a sky much clearer, K and KN, amount 6 and a moderate sea in Cocanada roads.

Since early morning of the 17th winds along the Circars and north Coromandal coast had considerably strengthened and after 8 hours rain commenced along the north Coromandal coast and extended in Ganjam during the day.

As the storm gradually approached the north Coromandal coast, the weather along the coast ; deteriorated. The enclosed report from the Hindu of 18th November 1933 gives a very graphic picture of the weather experienced at Madras on the 17th. (See report given at the end of the description).

The following remarks of Port Officers at Cocanada and Madras for 17th and 18th are also interesting :—

| Station. | Date. | Time. | Remarks. |
|---|---|---|---|
| Madras . . | 16th | 11 hours | The weather was cloudy and windy throughout the day. The state of sea outside the harbour was rough from the north. The highest wind velocity was 30 miles per hour at 1 P.M., direction north. The barometer dropped ·06″ in 24 hours. |
| Madras . . | 17th | 14 hours | The weather was cloudy and misty with high wind and rain throughout the day and gradually moderated by midnight. The state of sea was very rough from the south in the forenoon and gradually moderated by midnight. The highest velocity of wind was 46 miles at 1-20 P.M. direction WSW. The barometer dropped ·14″ in 24 hours. |
| Cocanda . . | 17th | 11 hours | Sky heavily clouded with KN and AS clouds. Fresh and strong NE and NNE winds blowing and showers. |
| | | 14 hours | Sky completely clouded with KN and AS clouds. Strong and occasional squally wind blowing from NE and weather becoming squally. |
| | | 18 hours | Sky heavily clouded with KN and AS clouds. Squally weather coming from NE and very rough sea. |

At 14 hours the storm was centred within half a degree of Lat. 14½°N., Long. 82°E. and was apparently moving rapidly in a northwesterly direction. As it approached the coast between Nellore and Masulipatam, the barometer at Nellore which was 29·67 at 11 hours dropped down to 29·43 at 14 hours and further dropped to 28·95 at 17 hours. The following table gives the observations recorded at Nellore on the 17th.

| Date. | Hour. | Bar. | Change during 24 hours. | Dep. | Wind. Dir. | Wind. Force. | Remarks. |
|---|---|---|---|---|---|---|---|
| | | ″ | ″ | ″ | | | |
| 17th . . | 08-00 | 29·76 | —·12 | —·17 | WNW | 4 | Continuous drizzle. |
| | 11-00 | ·67 | —·22 | —·25 | WNW | 5 | Continuous moderate drizzle. |
| | 14-00 | ·43 | —·37 | —·42 | WNW | 5 | Intermittent moderate drizzle. |
| | 17-00 | 28·95 | —·84 | —·88 | WNW | 10 | Moderate rain-showers. |
| 18th . . | 08-00 | 29·85 | +·09 | —·08 | SE | 2 | |

At 17 hours the storm was centred very close to the coast between Masulipatam and Nellore. The above table shows that at this stage, the pressure departure near the centre of the storm was of the order of—0·9″ and winds in the neighbourhood of Nellore had attained terrific force.

The storm crossed coast between Nellore and Masulipatam during the early hours of the 18th and weakening thereafter lay as a depression over the Madras Deccan at 8 hours of the same day. It continued to weaken during its northwestward passage across the Deccan and after crossing the ghats it passed out into the east Arabian Sea as a low pressure wave by the 19th morning. In this connection weather was slightly disturbed off the Konkan during that day.

While the storm was approaching the Madras coast and during its subsequent movement widespread rain occurred in front of it, rainfall being locally heavy on the north Coromandal coast and in the Madras Deccan on the 17th. It is reported that strong winds in connection with this storm caused considerable damage to property in the Nellore district.

Some noteworthy falls of 5″ and above over northeast Madras are given below :—

| Station. | 18th. |
|---|---|
| | ″ |
| Guntur . . . . . | 7 |
| Gudur . . . . . | 6 |

## " THE HINDU ", 17TH NOVEMBER 1933.

### Squally Weather in Madras, Bay Depression moving northwest.

*Rayapuram Embankment breached.*

*Madras, November 17.*

The depression that has formed in the Bay has produced squally weather in the city since last evening accompanied by heavy showers. High winds began blowing yesterday afternoon and increased in intensity towards the early hours of this morning. The skies became heavily overcast soon after sunrise today and since, Madras has been experiencing a steady shower and winds. The temperature which stood at 82° yesterday fell considerably and at 3 P.M. today stood at 68°. The local storm signal has also been hoisted in the harbour signalling station. The rainfall recorded between 8 A.M. and 2 P.M. today is only 74 cents.

As a result of the weather conditions there was a swell in the harbour and ships at their moorings began to cause trouble. The *S. S. City of Venice* lying in the harbour began to tug at its moorings and break the ropes. It was with great effort that the harbour authorities succeeded in fastening up the vessel to her berth.

*Rough Sea.*

The sea has been rough since yesterday morning and towards nightfall became rougher still. Huge billows overtopped the eastern breakwater. The Rayapuram embankment was a striking sight this morning. Some of the huge boulders massed along the edge of the sea to break the force of the waves had been hurled far into the road. Heavy cast-iron pipes stacked on the foreshores were lifted up by the waves and thrown pell mell across the tram-track on the embankment. The tide advanced so far and the waves rose so high that sometimes they reached the road. They subsided a bit after sunrise and the clearing of the road for tram car traffic took sometime. The sea still continues rough.

The Rangoon steamer which usually leaves on Fridays at about 10 A.M. has been detained for a few hours. It is learnt it will leave by 3 P.M. Two steamers *S. S. Barbarigo* and *S. S. Cape St. George* due in the harbour today have not yet arrived. In all probability, they may not come in before tomorrow.

The depression is now located at about 200 miles northeast of Madras and is stated to be moving in a northwesterly direction with a possibility of curving due north at a velocity of about thirty miles an hour. If it maintains its present direction and velocity, it may strike the coast between Masulipatam and Cocanada in the course of this day.

The weather in the City, it is stated, is not likely to clear up before tomorrow afternoon.

25. *Severe Storm of 12th-17th December 1933.*—On the morning of the 10th, pressure change and departure charts show that pressure was falling over the south Bay and the Andaman sea and observations from ships suggested that the northeast monsoon was strengthening to the south of Lat. 10°N. By the morning of the next day strong monsoon winds were experienced in the south Bay. The following observations from ships indicated that a cyclonic circulation existed in the south Bay to the east of Ceylon.

| Date. | Steamer. | Hour. | Position. | | Wind. | | Sea. | Swell. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|
| | | | Lat. N. | Long. E. | Dir. | Force. | | | |
| | | | ° ′ | ° ′ | | | | | |
| 11th December . | " Unemaru " . . | 08-00 | 8 8 | 89 2 | SE | 7 | .. | .. | Generally cloudy and rain. |
| | " Birk " . . | 08-00 | 8 5 | 84 8 | N | 6 | High . | .. | c. r. q. |
| | " Saugor " . . | 06-30 | 5 6 | 87 2 | SW | 4 | Moderate . | Low . | |
| | " Jalaveera " . | 08-00 | 10 4 | 87 6 | NE | 5—6 | .. | .. | Rain. |
| | " Barjora " . . | 06-30 | 10 8 | 88 0 | NE | 5 | Moderate . | Moderate . | Int. slight rain. |
| | " Goalpara " . . | 06-30 | 10 2 | 87 1 | NE | 5 | Rough . | Moderate . | Slight or moderate drizzle or rain. |
| | " Rajula " . . | 10-30 | 10 1 | 85 2 | NE | 6 | V. Rough . | .. | Rain with squall. |

Negative barometric tendencies of the order of 0·04″ were reported by *S. S. Rajula, Goalpara* and *Barjora* on the 11th morning. Most of the stations in Ceylon had rain on the 10th, Batticaloa recording 4″.

During the course of the day pressure continued to fall over the south Bay. Rough sea, squally weather and rain were reported by most ships to the south of Lat. 10°N. The observations of the ships given below suggested that a depression had formed in the south Bay on the 12th morning with central region in the neighbourhood of Lat. 7½°N., Long. 85½°E.

| Date. | Steamer. | Hour. | Position. | | Wind. | | Sea. | Swell. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|
| | | | Lat. N. | Long. E. | Dir. | Force. | | | |
| | | | ° ′ | ° ′ | | | | | |
| 12th December . | "Chitral" . . | 00-00 | 6 1 | 86 8 | NW/W | 5 | .. | .. | Cloudy, showers. |
| | "Chitral" . . | 08-00 | 6 2 | 84 3 | W/N | 4 | Rough . | Moderate . | Overcast. |
| | "Chitral" . . | 11-30 | 6 1 | 84 5 | WSW | 7 | .. | .. | |
| | "Rohna" . . | 06-30 | 8 4 | 88 0 | SSE | 4 | Moderate . | Moderate . | Int. slight rain. |
| | "Barjora" . . | 06-30 | 8 9 | 85 2 | ESE | 5 | .. | .. | |
| | "Goalpara" . . | 06-30 | 8 5 | 84 4 | NE | 5 | Rough . | Heavy . | Rain, squally. |

*S. S. Jalaveera* of the Scindia Steam Navigation Company passed through the region of disturbed weather on her way from Rangoon to Colombo and an extract from her logs for the 12th is interesting.

| Date. | Hour. | Position. | | Wind. | | Weather. | Sea. | Swell. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|
| | | Lat. N. | Long. E. | Dir. | Force. | | | | |
| | | ° ′ | ° ′ | | | | | | |
| 12th December . | 04-00 | .. | .. | E | 6 | .. | .. | .. | 7-45 A.M. wind backing. Wind increasing rapidly with very frequent fierce sq. Very rough confsd. sea and heavy confsd. swell. Vessel's speed reduced to avoid damage by weather at 11-15 A.M. |
| | 06-30 | 8 05 | 84 6 | NE | 7 | .. | .. | .. | |
| | 08-00 | 8 12 | 84 22 | Var. | 8 | o. q. r. | V. Rough . | Heavy . | |
| | Noon | 8 00 | 84 00 | NW | 8—9 | o. q. r. | V. Rough . | Heavy . | Cont. heavy rain squalls. |
| | 16-00 | 7 48 | 83 36 | W/N | 8 | o. q. r. | V. Rough . | Heavy . | Weather moderating slightly. |
| 12th December . | 20-00 | 7 35 | 83 12 | NW | 7—8 | o. q. r. | V. Rough . | Heavy, NW | Squally occurring less frequently. Weather gradually improving. |
| | Midnight | 7 22 | 83 03 | NW | 6—7 | o.r. | Rough . | Moderate . | Strong wind, light rain, heavy sea and swell, overcast and clear. |
| 13th . . | 04-00 | 7 08 | 82 45 | NW | 6 | .. | .. | .. | Improvement in weather steadily maintained. |

At 8 hours of the 12th "*Jalaveera*" also reported a negative tendency of the order of 0·15″, suggesting thereby that the pressure was still falling rapidly to the east of Ceylon. During the course of the day the depression deepened and intensified into a storm by the same evening; it was centred at 17 hours within half a degree of Lat. 8½°N., Long. 85°E. Winds of gale force were reported on the 12th afternoon by the following two ships as well as by *S. S. Jalaveera* within a distance of about 150 miles from the centre of the disturbance.

| Date. | Steamer. | Hour. | Position. | | Wind. | | Sea. | Swell. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|
| | | | Lat. N. | Long. E. | Dir. | Force. | | | |
| | | | ° ′ | ° ′ | | | | | |
| 12th December . | "Barjora" . . | 13-30 | 8 2 | 83 7 | NW | 8 | V. Rough . | .. | |
| | | 16-30 | 8 2 | 83 8 | N | 8 | High . | Heavy . | Continuous rain. |
| | | 18-30 | 8 2 | 83 8 | NNW | 8 | V. Rough . | Heavy . | Continuous heavy rain. |
| | "Goalpara" . | 12-30 | 8 2 | 84 1 | WNW | 8 | Rough . | Heavy . | Continuous heavy rain. |
| | | 16-30 | 7 5 | 83 5 | W | 8 | High . | Heavy. | |

The storm moved slowly in a northwesterly direction intensifying at the same time. By the morning of the 13th the cyclonic storm was centred within half a degree of Lat. 9½°N., Long. 83½°E. At this stage the cyclonic circulation in the upper air extended upto at least 4 Km. height. *S. S. Barjora* (Lat. 8-3°N., Long. 83-7°E.) which was about 80 miles to the south of the storm centre reported high sea, continuous rain and westsouthwesterly wind of force 9.

Continuing to move slowly in a northwesterly direction, the storm was centred near Lat. 10°N., Long. 82½°E. on the evening of the 13th. The storm intensified still further and by the morning of the 14th it became severe and was centred within half a degree of Lat. 10½°N., Long. 82°E. Under its influence widespread light to moderate rain had occurred in Ceylon with a heavy fall of 4″ at Trincomalee and rain had also extended into southeast Madras.

Moving very slowly in the same direction, the storm was centred about 150 miles to the sotheast of Cuddalore at 14 hours. Winds along the Coromandal coast had strengthened with the approach of the storm. Madras began to experience squally weather after 14 hours as will be seen from the following report of the Port Officer, Madras.

| Station. | Date. | Remarks. |
|---|---|---|
| Madras . . . | 14th December 1933 | The weather was squally and sky overcast, light drizzle at intervals between 2-41 and 6-10 A.M. Rain with squalls from the north commenced at intervals between 11-15 A.M. and 11-18 P.M. (The highest velocity of wind was 50 miles per hour at 9-30 P.M. direction NNE) The weather was getting worse. The sky was heavily overcast, with hard squalls from the north. The storm haze increased. The sea rose to a tremendous state. The barometer dropped ·04″ in 24 hours. |
| | 15th December 1933 | On the 15th, the weather became still worse with heavy rain and squalls from northeast at intervals throughout the day and night. Highest wind velocity was 55 miles per hour at 1-55 P.M. direction ENE. The barometer dropped 0·11″ in 24 hours. |
| | 16th December 1933 | The weather was squally and sky overcast in the early part of the forenoon, the wind changed its direction to south at 8 A.M. The weather moderated gradually by noon. |

Extracts from the logs of the *S. S. Birk, Erinpura, Favorit* and *Vinistra* which are given below give an idea about the severity of the storm :—

| Date. | Steamer. | Hour. | Position. | | Wind. | | Weather. | Sea. | Swell. |
|---|---|---|---|---|---|---|---|---|---|
| | | | Lat. N. | Long. E. | Dir. | Force. | | | |
| | | | ° ′ | ° ′ | | | | | |
| 12th December . | S. S. Birk . . | 04-00 | 8 52 | 85 18 | N | 9 | c. r. q. | Very high. | |
| | | 08-00 | 8 54 | 85 18 | NNW | 10 | c. r. q. | Precipitous. | |
| | | Noon | 8 55 | 85 19 | WNW | 11 | c. r. q. | Precipitous. | |
| | | 16-00 | 9 06 | 85 33 | WNW | 11 | c. r. q. | Precipitous. | |
| | | 20-00 | 9 17 | 85 47 | SW | 10 | c. r. q.. | Precipitous. | |
| | | Midnight | 9 28 | 86 01 | SSE | 10 | c. r. q. | Precipitous. | |
| 13th . . | | 04-00 | 9 39 | 86 15 | S | 9 | c. r. q. | Precipitous. | |
| | | 08-00 | 9 50 | 86 29 | SSE | 8—9 | c. r. q. | Precipitous. | |
| | | Noon | 10 03 | 86 43 | SSE | 8 | c. r. q. | Precipitous. | |
| | | 16-00 | 10 23 | 87 01 | SE | 9 | c. r. q. | Precipitous. | |
| | | 20-00 | 10 43 | 87 19 | ESE | 8 | c. r. q. | Very high. | |
| | | Midnight | 11 03 | 87 37 | ESE | 8 | c. r. q. | Very high. | |
| 14th . . | | 04-00 | 11 23 | 87 55 | ESE | 6 | c. r. q. | Very high. | |
| | | 08-00 | 11 43 | 88 13 | SE | 8 | c. r. q. | Very high. | |
| | | Noon | 12 03 | 88 31 | SE | 8 | c. r. q. | Very high. | |
| | | 16-00 | 12 17 | 89 0 | SE | 8 | c. r. q. | Very high. | |
| 14th . . | S. S. Erinpura . | 16-00 | 13 18 | 80 40 | N | 7 | o. r. q. | High . . . | Heavy. |
| | | 20-00 | 13 32 | 81 03 | N/E | 8 | o. q. | High . . . | Heavy. |
| | | Midnight | 13 40 | 81 24 | NE/N | 6 | o. q. r. | High . . . | Heavy. |

| Date. | Steamer. | Hour. | Position. | | Wind. | | Weather | Sea. | Swell. |
|---|---|---|---|---|---|---|---|---|---|
| | | | Lat. N. | Long. E. | Dir. | Force. | | | |
| | | | ° ′ | ° ′ | | | | | |
| 15th . . | S. S. Erinpura | 04-00 | 13 25 | 80 50 | NNE | 6 | o. d. q. | High . . . | Heavy. |
| | | 08-00 | 13 25 | 80 50 | NE/E | 8 | o. r. q. | High . . . | Heavy. |
| | | Noon | 13 11 | 81 09 | E/N | 8 | o. q. | High . . . | Heavy. |
| | | 16-00 | 13 38 | 81 07 | E | 6 | o r. q. | High . . . | Heavy. |
| | | 20-00 | 13 50 | 81 25 | E | 5 | o | Very rough. | |

Remarks of *S. S. Erinpura*.—14th December 1933. 4 P.M. heavy, rain-squall, visibility very poor. 5 P.M., vessel labouring heavily. Frequent heavy rainsqualls throughout watch. Continuous drizzle with frequent severe squalls. Visibility generally poor 00-20 hrs. of 15th December 1933. Weather moderating. Visibility poor. Frequent heavy squalls accompanied by heavy rain from NNE to E. 5 A.M., wind increasing in force with violent rainsqualls. Torrential rain. 8 A.M. sky clearing slightly. Visibility poor. Frequent heavy squalls. Passing heavy rainshowers. 8 P.M., weather improving, mainly overcast, frequent heavy rainsqualls. Visibility good.

| Date. | Steamer. | Hour. | Position. | | | | Wind. | | Weather. | Sea. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Lat. | | Long. | | Dir. | Force. | | |
| | | | ° | ′ | ° | ′ | | | | |
| 15th December . | "Favorit" . . . | 04-00 | 13 | 09 | 93 | 06 | ESE | 5—4 | o. r. | Very rough. |
| | | 08-00 | 13 | 03 | 91 | 30 | ESE | 5 | c. q. p. | Very rough. |
| | | Noon | 12 | 57 | 91 | 00 | ESE | 7 | q. r. | Very high. |
| | | 16-00 | 12 | 56 | 90 | 32 | ESE | 6—8 | q. r. | Very high. |
| | | 20-00 | 12 | 54 | 90 | 04 | ESE | 6—10 | q. r. | Precipitous. |
| | | Midnight | 12 | 53 | 89 | 36 | ESE | 6—10 | q. r. | Precipitous. |
| 16th . . | | 04-00 | 12 | 51 | 89 | 08 | SE | 7—10 | q. r. | Precipitous. |
| | | 08-00 | 12 | 49 | 88 | 39 | SE | 7—10 | q. r. | Precipitous. |
| | | Noon | 12 | 48 | 88 | 14 | SE | 7—10 | q. r. | Precipitous. |
| | | 16-00 | 12 | 43 | 88 | 04 | SE | 7—10 | q. r. | Precipitous. |
| | | 20-00 | 12 | 38 | 87 | 53 | SE | 7—10 | q. r. | Precipitous. |
| | | Midnight | 12 | 33 | 87 | 42 | SE | 9 | o. q. | Precipitous. |

| Date. | Steamer. | Hour. | Position. | | Wind. | | Weather. | Sea. | Swell. |
|---|---|---|---|---|---|---|---|---|---|
| | | | Lat. N. | Long. E. | Dir. | Force. | | | |
| | | | ° ′ | ° ′ | | | | | |
| 14th December . | S. S. Vinistra . . | 04-00 | .. | .. | NNE | 9 | o. r. q. | High. | |
| | | 08-00 | .. | .. | NNE | 9 | o. r. q. | Very high. | |
| | | Noon | 14 18 | 81 43 | NNE | 7—8 | o. r. q. | Very high. | |
| | | 16-00 | 14 22 | 81 54 | NE | 7—8 | o. r. q. | Very high. | |
| | | 20-00 | 14 27 | 82 05 | NE | 9 | o. r. q. | Very high. | |
| | | Midnight | 14 31 | 82 16 | NE | 9 | o. r. q. | Very high. | |
| 15th . . | | 04-00 | 14 36 | 82 27 | NE | 9 | o | Very high. | |
| | | 08-00 | 14 40 | 82 39 | NE | 8 | o | Very high. | |
| | | Noon | 14 45 | 82 51 | NE | 8 | o. r. q. | High. | |
| | | 16-00 | 15 08 | 83 12 | NE | 6 | o. r. q. | High. | |

At 23 hours the severe storm was centred about 100 miles to the southeast of Cuddalore. It then took a westerly course and was centred at 8 hours of the 15th about 40 miles east-southeast of Cuddalore. At this stage a pressure departure of the order of —·500 existed near the centre of the storm.

The following weather remarks from the Port Officers of Negapatam, Porto Novo and Cuddalore are very interesting :—

| Station. | Date. | Remarks. |
|---|---|---|
| Negapatam . . | .... | "During the approach of the cyclonic storm between the 12th and 15th December 1933, the Port experienced from 2 hours on 15th December 1933 heavy squalls and continuous rain the wind coming first from north-west with high and confused sea and heavy swell from northeast, the wind backing to west and later west-southwest until 14 hours and then backing to southwest and south when the storm crossed the coast north of the Port. |
| Porto Novo . . | 15th December . | The weather was cyclonic from 14th midnight and lasted till the midnight of the 15th with rough sea and occasional heavy showers of rain. Telegraphic communication ceased from the noon of 15th December 1933. |
| Cuddalore . . | 15th December . | A severe cyclonic storm of great intensity passed south of the Port of Cuddalore on the 15th December 1933 the centre of the cyclone crossing the coast at Porto Novo about 6 P.M. on that date. It has caused widespread damage. At its height it caused a six foot (above M. H. W. Springs) storm wave to sweep the coast in its vicinity. The wind held steady north, force 6, on the 14th and at 6 A.M. on the 15th was NNE force 7. At 10 A.M. (Bar. 29·80) wind was NE force 8, with fierce squalls of force 10. It remained steady at NE gradually increasing until 2 P.M. It was blowing steady at force 10 with bar. 29·35. The rainfall was inconsiderable as the strength of the wind blew it into fine particles like sleet. At 4 P.M. the barometer had fallen to 29·12 and between 5 and 6 P.M. was 29·00 and the wind had veered to the east, force 11, with frequent terrific squalls rising to force 12. This easterly wind blowing direct from the sea caused a sudden rise of water in an hour of about 6 feet above high water springs inundating the whole of the lower ground on the sea coast and causing tremendous damage. The rivers Gadilam, Uppanar and Paravanar resembled a rough sea. The height of the water may be gauged by the fact that it was within one and a half feet of the trusses of the boat-house roof and lapping the verandah of the office. The wind shifted to ESE Bar. 29·15 about 8 P.M. still blowing at force 11 with frequent squalls of force 12. At 11 P.M. wind was southeast, force 11, but easing rapidly. The storm wave receded as rapidly as it rose till by midnight it had more or less completely receded. At 6 A.M. on the 16th the wind was south, force 6, at 8 A.M. SSW, force 5, at 10 A.M. SW, force 5. It then backed to south, force 4, about noon, gradually backing to SE and moderating all the time. Heavy rain fell during the night of the 16th and there is now high flood in both the rivers Paravanar and Gadilam." |

Moving in a westnorthwesterly direction, the storm crossed the south Coromandal coast slightly to the south of Cuddalore on the evening of the 15th. From the report of the Cuddalore Port Officer given above as well as of the observer there, it appears that the pressure deficiency near the centre of the cyclone at the time of its passage inland was at least 1″. Thereafter it weakened and lay as a depression over southeast Madras on the 16th. The depression filled up there on the next day, but induced unsettled conditions in the southeast Arabian Sea off Kanara. These unsettled conditions moved slowly northwards and became unimportant off the Konkan on the 20th.

The disturbance caused widespread rain in southeast Madras and Mysore between the 14th and 16th, rainfall being specially heavy in the Nellore, Madras, Chingleput and Arcot districts. With the northward movement of the unsettled conditions off the west coast, rainfall also extended into Kanara, the Konkan, the Deccan and in and near the central parts of the country. According to newspaper reports, heavy rain and strong winds in connection with this cyclone caused severe floods resulting in considerable damage to telegraphs and railway lines as well as to crops and property in the Madras, Chingleput and Arcot districts. It is reported that some lives were also lost and a train was thrown off the rails near Cuddalore by strong winds. The rain in and to the north of the Peninsula also appears to have caused damage to standing crops there.

The noteworthy falls of 5″ and over during the course of the disturbance are mentioned below :—

| Stations. | 16th. | 17th. | 18th. |
|---|---|---|---|
| | ″ | ″ | ″ |
| Iskapalle . . . . . | .. | 5 | 6 |
| Gudur . . . . . | .. | 5 | .. |
| Rapur . . . . . | 5 | .. | .. |
| Venkatagiri . . . . . | .. | 5 | .. |
| Sulurpet . . . . . | 6 | .. | .. |
| Tada . . . . . | 5 | 5 | .. |
| Madras . . . . . | 6 | 6 | .. |
| Attipet . . . . . | 6 | 7 | .. |
| Ponneri . . . . . | 8 | 8 | .. |
| Sattiavedu . . . . . | 8 | .. | .. |
| Tiruvellore . . . . . | 8 | 5 | .. |
| Conjeevaram . . . . . | 5 | .. | .. |
| Sriperumpudur . . . . . | 5 | .. | .. |
| Poonamalle . . . . . | 7 | .. | .. |
| Saidapet . . . . . | 6 | 6 | .. |
| Chingleput . . . . . | .. | 6 | .. |
| Uttiramerur . . . . . | .. | 5 | .. |
| Tiruttani . . . . . | 6 | .. | .. |
| Puttur . . . . . | 5 | .. | .. |

| Stations. | 16th. | 17th. | 18th. |
|---|---|---|---|
| | " | " | " |
| Tirupati | 7 | .. | .. |
| Tsadam | 5 | .. | .. |
| Palliput | 7 | .. | .. |
| Arkonam | 6 | .. | .. |
| Vellore | 5 | .. | .. |
| Vanur | .. | 6 | .. |
| Villupuram | .. | 6 | .. |
| Panruti | .. | 9 | .. |
| Chidambaram | 6 | .. | .. |
| Mannargudi | 10 | .. | .. |
| Srimushnam | 8 | 6 | .. |
| Tittagudi | 6 | .. | .. |

| Stations. | 16th. | 17th. | 18th. |
|---|---|---|---|
| | " | " | " |
| Vriddachalam | 5 | .. | .. |
| Kallakurichi | 6 | .. | .. |
| Shiyali | 9 | .. | .. |
| Neidavasal | 9 | .. | .. |
| Tranquebar | 15 | .. | .. |
| Mayavaram | 5 | .. | .. |
| Kumbakonam | 5 | .. | .. |
| Ariyalur | 13 | .. | .. |
| Jayankonda Cholapuram | 9 | .. | .. |
| Pudukottai | .. | 8 | .. |
| Hosdrug | .. | .. | 8 |
| Kasaragad | .. | .. | 6 |

# WESTERN DISTURBANCES.

The following is a list of the western disturbances which affected the weather in northern India during the year with the dates of which they did so and brief notes on the precipitation that they produced :—

| Serial No. | Date. | Remarks. |
|---|---|---|
| | *January.* | |
| 1 | 1—3 | Local falls of rain or snow in Kashmir from 1st to 3rd and in Assam on the 3rd. |
| 2 | 4—6 | Light local falls of rain or snow in Kashmir on the 5th and 6th. |
| 3 | 9—12 | Passing drizzles along the frontier and in Kashmir on the 10th and local falls of rain or snow in Kashmir on the 11th and 12th. |
| 4 | 15—17 | A few falls of rain or snow in Kashmir on the 15th and along the frontier and the western Himalayas on the 16th. |
| 5 | 17—21 | General rain or snow along the frontier, the Punjab hills and Kashmir and local falls of rain in the plains of the east and north Punjab on the 17th. Widespread rain or snow also occurred in the North-West Frontier Province, Kashmir and the adjoining Punjab hills on the 18th, local falls in Kashmir on the 19th and general rain in Chota Nagpur on the 21st with a few falls in Bihar, Bengal and Assam on the same date. |
| 6 | 20—25 | Local rain or snow in Baluchistan and Kashmir on the 20th and 21st; widespread rain or snow along the western Himalayas, local rain in the United Provinces and Assam and general rain in Chota Nagpur and adjacent districts on the 22nd; widespread rain fell from the United Provinces to Assam on the 23rd and in the region extending from the east Central Provinces to west Bengal as well as in north Assam on the 24th. On the next day rainfall was practically confined to the coast line from Vizagapatam to Saugor Island. |
| 7 | 26th January—2nd February. | Light local falls of rain or snow in north Baluchistan on the 26th and in the North-West Frontier Province and Kashmir from the 29th to 31st. Light falls of rain or snow in Kashmir on the 1st and in northeast Assam on the next two days. |
| | *February.* | |
| 8 | 4—8 | Scattered light precipitation in Kashmir on the 5th; a few light showers in Assam on the 6th and 7th and in Bengal on the latter date. |
| 9 | 7—13 | Light local falls from Baluchistan to Kashmir from 8th to 10th and in Baluchistan alone on the 7th. Widespread rain in the western Himalayas between the 10th and 12th. Thunderstorm rain was widespread in the United Provinces and northeast India on the 12th, while on the 13th there was widespread rain from Bihar to Assam. |
| 10 | 13—21 | Widespread rain fell in Baluchistan on the 13th and local rain or snow in Baluchistan and the north Punjab on the 14th. Local thundershowers occurred from the east Central Provinces to southwest Bengal between the 16th and 20th, in Assam on the 17th and 18th and in the west Central Provinces on the 19th and 20th. |
| 11 | 18—22 | Local rain in northeast Baluchistan on the 19th and 20th, in the Punjab-Kumaon hills on the 21st and in northeast Assam on the 22nd. |
| 12 | 20—26 | General rain in Baluchistan, the west Central Provinces and north Hyderabad on the 22nd; general rain or snow over the western Himalayas and adjacent plains and extensive thunderstorm rain over the central parts of the country from the 23rd to 26th; extensive thunderstorm rain also occurred in the plains of north-west India on the 23rd, in the United Provinces on the 24th and 25th and in Bihar and Orissa on the 24th. |

| Serial No. | Date. | Remarks. |
|---|---|---|
| 13 | 28th February—3rd March. | A few light falls of rain in Baluchistan on the 1st and 2nd. |
| | *March.* | |
| 14 | 4—10 . . | Widespread rain or snow in Kashmir and the adjoining Punjab hills with scattered falls of rain along the northwest frontier from the 5th to 8th, extensive rain in the plains of the Punjab on the 7th and a few falls in Assam on the 9th and 10th. |
| 15 | 11—12 . . | A few light falls of rain or snow in Kashmir on the 12th. |
| 16 | 14—19 . . | Local rain in Baluchistan on the 16th and widespread dust and thunderstorms from Baluchistan to the Punjab, with general rain along the frontier and a few falls in upper Sind, the southwest Punjab and the Punjab hills on the 17th; general rain or snow also occurred in Kashmir with widspread thunderstorm rain in the east and north Punjab and the North-West Frontier Province on the 18th. Scattered thunderstorms occurred in and near the Kumaon hills on the 18th and 19th. |
| 17 | 19—21 . . | Local rain or snow in Kashmir with a few falls in the North-West Frontier Province and the Punjab-Kumaon hills on the 20th and 21st. |
| 18 | 22—24 . . | Light local showers along the frontier with a few falls of rain in the Punjab hills on the 22nd, scattered thunderstorms and local rain in northwest India on the 23rd and a general extension of thunderstorm rain in the east and north Punjab and the west United Provinces on the next day; local rain also occurred in the North-West Frontier Province, Kashmir and east Central India with a few falls in the southwest Punjab, east Rajputana, Gujarat and west Central India on the 24th and in the western Himalayas on the 25th. |
| 19 | 27—30 . . | Scattered duststorms or thunderstorm rain or snow along the northwest frontier, Baluchistan and Kashmir between the 28th and 30th. |
| 20 | 31 . . . | A few falls of rain along the north-west frontier on the 31st. |
| | *April.* | |
| 21 | 1 . . . | A few falls of rain in Kashmir. |
| 22 | 1—6 . . | Widespread rain in Baluchistan, the North-West Frontier Province, Kashmir and the Punjab hills on the 3rd and 4th, in the western Himalays on the 5th and in Assam on the 5th and 6th. |
| 23 | 7—8 . . | Local rain in Kashmir on the 8th. |
| 24 | 9—11 . . | Widespread rain in northeast Baluchistan on the 9th and in the western Himalayas and the adjoining plains on the 10th and 11th. |
| 25 | 12—14 . . | Widespread rain from frontier to Assam on the 12th and 13th and in northeast India on the 11th and 14th. |
| 26 | 14—16 . . | Light local rain mainly in the hills of the frontier and Kashmir. |
| 27 | 18—22 . . | Precipitation occurred mainly on the hills in northwest India and was widespread in the east United Provinces and north-east India. |
| 28 | 24—26 . . | Local showers in Kashmir and the adjoining districts between 24th and 26th. |
| 29 | 27—30 . . | Fairly widespread rain associated with duststorms or thunderstorms over the greater part of northwest India, the United Provinces and the central parts of the country on the 29th and 30th. |
| | *May.* | |
| 30 | 1—4 . . | Fairly widespread thunderstorm rain in the east and north Punjab and the surrounding hills with scattered falls over the rest of northwest India between the 1st and 4th; widespread thunderstorms also occurred during this period in the central parts of the country. |
| 31 | 6—11 . . | Widespread thunderstorms over northern India and the central parts of the country with locally heavy falls of rain in north-east India. |
| 32 | 10—16 . . | Widespread rain in the North-West Frontier Province and Kashmir with local falls in north Baluchistan and the plains of the east and north Punjab, the west United Provinces and east Rajputana. Rainfall also occurred over a wide area in north-east India between the 14th and 17th. |
| 33 | 17—20 . . | Local rain in the North-West Frontier Province on the 17th and 19th and general rain in Assam on the 20th. |
| 34 | 27—30 . . | A few light showers in Baluchistan on the 28th and local duststorms in the North-West Frontier Province and thundershowers in the Kumaon hills on the 30th. |
| | *June.* | |
| 35 | 4—6 . . | Scattered duststorms in the northwest frontier on the 4th, light thundershowers in Kashmir on the 4th and 5th, scattered dust or thunderstorms in the Punjab and the United Provinces on the 5th and a few thundershowers along the western Himalayas on the 6th. |
| | *July*<br>*August*<br>*September* | No well-defined western disturbances. |
| | *October.* | |
| 36 | 12—14 . . | Widespread rain in the North-West Frontier Province, Kashmir and the Punjab hills between the 12th and 14th. |
| 37 | 25—27 . . | A few falls in Kashmir on the 25th. |
| | *November.* | |
| 38 | 12—14 . . | No precipitation. |
| 39 | 16—21 . . | A few light falls of rain in Baluchistan on the 18th, along the northwest frontier on the 19th and in Kashmir from the 19th to 21st. |

| Serial No. | Date. | Remarks. |
|---|---|---|
| | *November.* | |
| 40 | 25—27 . . | A few falls in Baluchistan on the 25th and nearly general rain in the east and north Punjab with local falls in the North-West Frontier Province and Kashmir on the 26th. |
| 41 | 28—30 . . | A few light showers of rain or snow in Kashmir on the 28th and 29th. |
| 42 | 30th November—4th December. | A few light showers along the northwest frontier on the 2nd and general rain in north Baluchistan and local rain in the North-West Frontier Province and the southwest Punjab on the next day. |
| | *December.* | |
| 43 | 5—8 . . | A few light showers in Kashmir on the 7th and in the North-West Frontier Province on the 5th and 7th. |
| 44 | 10—12 . . | Scattered showers in and near the Punjab Kumaon hills on the 11th and a few falls in Assam on the 12th. |
| 45 | 14—15 . . | No precipitation. |
| 46 | 18—20 . . | Light showers in north Baluchistan on the 19th. |
| 47 | 22—25 . . | A few light showers in and near Kashmir on the 23rd and 25th. |
| 48 | 27—30 . . | A few falls of rain or snow in Kashmir on the 29th. |

## LOCAL STORMS.

Of the local storms eported in the newspapers, the following are noteworthy :—

*January 7th.*—A hailstorm in the Thakurgaon sub-division (Dinajpur district) caused havoc to the standing crops especially sugar-cane and paddy along its track.

*March 2nd week.*—A hailstorm caused considerable damage to crops in several districts in the Central Provinces.

*March 12th.*—A storm of great intensity broke out at Allahabad during the night. One of the planes in which the officers of the Houston-Everest expedition flew to India broke loose its moorings at Bamrauli Aerodrome and was completely wrecked.

*March 24th.*—During a hailstorm at Abbotabad, lightning struck a barrack building causing serious injuries to a number of Gurkha soldiers. Crops and property in Hazara area were damaged owing to continuous rain and hailstorms.

*March 27th.*—A severe storm passed over Comilla in the evening. Many houses were blown down and trees uprooted. No loss of life was reported.

*April 1st.*—A severe duststorm accompanied by a violent wind occurred at Dhubri, causing considerable damage to property. The wind is reported also to have damaged the crops, mangoes being the hardest hit.

*April 7th.*—Considerable damage was caused by a severe storm which passed over Tiruppur. Heavy rain flooded the streets and the electric supply failed.

*April 8th.*—A severe storm passed over Feni (Chittagong district) in the evening. Many houses were demolished, trees uprooted and considerable damage caused. Some persons were reported to have been injured but no loss of life was reported.

*April 9th.*—A country craft "*Ratnagiri*" loaded with tiles, a tindal and a crew of five encountered a heavy storm off Kanara coast and sank with the cargo. The crew were thrown out but were picked up by the crew of "*Manamadad*" and brought down to Bombay.

*April 2nd week.*—A severe storm passed over Noakhali town and suburbs blowing away the roofs of many houses and pulling down several houses to the ground. The storm was followed by heavy rain.

*April 13th.*—A storm passed over Bengal, particularly its eastern parts, on the 13th afternoon. It caused some loss of life and great damage to property and plantations. Communications were dislocated and trains held up. Almost all trains were very late in reaching the Sealdah terminus at Calcutta, some being detained over 4 hours on the way. Ranaghat about 48 miles to the north of Calcutta was perhaps the worst sufferer. Upto 14th afternoon telegraphic communications were suspended. It was reported that five persons were killed in a house crash at Ranaghat. Greatest havoc was wrought round Pairadanga, the station next to Ranaghat.

*April middle.*—A severe storm swept over the Kathiawar coast causing considerable damage to shipping. A vessel laden with timber from Malabar experienced a severe gale on its return journey to Mahuva, a Kathiawar port, with the result that its cargo had to be jettisoned off Kotda about 26 miles from Mahuva while another ship carrying a crago of cotton bales encountered a similar mishap off Kotda and was lost at sea. A third vessel which left Mahuva was reported to be missing.

A severe hailstorm occurred at Bara, a village near Tonk. Crops were seriously damaged and big-sized hail-stones struck many labourers causing injuries.

A gale swept over Suvasra Mandi in Mandasur district caused considerable loss to property estimated at about Rs. 50,000. The roofs of many houses were blown away and it is reported that the railway time-keeper was carried away by the gale and thrown in a gutter some 25 feet away.

*April 18th.*—A hailstorm accompanied by a hurricane was experienced at Mymensingh at about 10 P.M. The wind caused havoc to the Exhibition grounds, and the improvised auditorium made of corrugated iron sheets was blown away. Some persons were injured.

*April 22nd.*—A terrific gale blew over the villages Sudin and Muridpur within P. S. Adamdighi (Bogra district) on the night of the 22nd. The extent of damage done was considerable. Roofs of 80 houses were blown off, some of them to a distance of 3 miles, and a large number of trees were uprooted.

*April 22nd and 23rd.*—A fierce gale followed by a severe fall of hail swept over a large area of Purwa Tahsil in Unao district (U. P.) during the week end, resulting in 29 persons being killed and injuries to many others. Several trees were uprooted and huts and hamlets were wrecked. The gale extended over a zone of 16 miles long and 3 miles wide and caused great havoc over that region. Hundreds of cattle perished and the mango crops were completely ruined, while corn on the threshing floor in nearly all fields was either, scattered by the storm or damaged by saturation.

*April 23rd.*—A thunderstorm of great intensity passed over Deogarh (Santal Parganas, Bihar) between 2 and 3 A.M. accompanied by hail and torrential rain. Several houses were damaged and many trees uprooted.

*April 30th.*—As many as four boat disasters of a serious nature involving loss of several human lives took place in river Gorai as a result of a severe tornado passing over, Kushtia (Nadia district) and its surrounding villages on the evening of 30th and lasting for about one hour between 7 and 8 P.M.

*May 1st week.*—A severe thunderstorm passed over Tangail accompanied by a heavy shower of rain. Trees were uprooted and great damage was done to houses. The telegraphic communication was considerably interrupted and the electric wires were damaged with the result that the whole town was practically in darkness throughout the night.

*May 5th.*—A thunderstorm of great intensity burst over Faridpur and the adjoining villages in the evening. The storm continued for about an hour and was so severe that the roofs of many thatched houses were blown away, while several others were razed to the ground. A large number of trees were also uprooted.

*May 9th.*—A violent hailstorm which was attended with a heavy downpour passed Dinajpur in the evening. Many trees were uprooted and almost every house was affected. The mango, " bhadoi " and jute crops as well as vegetable plants were heavily damaged. One person died and several others sustained injuries.

*May 10th.*—A storm of great intensity was experienced at Murree during the night. Thunder with vivid flashes of lightning continued for over two hours, during which time heavy rain fell. Several land slides also occurred in many places.

*May 14th.*—A nor'wester passed over Calcutta on the evening of th› 14th. It was accompanied by thunder and violent flashes of lightning which struck a dwelling house.

*May 25th.*—A severe storm swept over Jubbulpore in the evening of the 25th. The violence was so great that hundreds of trees were uprooted, completely disorganising traffic and telegraph communication. The whole town was plunged into darkness owing to the failure of the electric supply. Several people are reported to have been injured and two were found dead. The severity of the storm was felt most near the Railway Station where the Railway quarters were considerably damaged. Part of the General Post Office roof was also blown away and a motor bus in Sadar Bazar was smashed by a falling tree.

*May 29th.*—A severe thunderstorm swept over Ratnagiri in the night, accompanied by a heavy downpour of rain. Gangway stairs of the Goa Mail Steamer *Rupavati* was smashed by the high waves. Boats carrying passengers were caught in the gale and reached the shores with great difficulty.

*August 3rd.*—Three persons were killed and many others injured as the result of a storm which swept over Cawnpore on the evening of the 3rd. Hundreds of trees were uprooted and numerous buildings seriously damaged. Electric and telephonic communications also failed for hours. Of the three victims two were swept off the Ganges bridge and drowned.

Kyaikto on the Pegu-Moulmein line was struck by a storm in the evening. There was no casualty but 11 houses were destroyed. This storm also caused havoc in several other places in Insein and Pegu districts. Thirty houses were destroyed and several persons were injured in Hlegu about 30 miles from Rangoon, while 25 houses were destroyed in Chinttygon a village near Mingaladon.

*August 1st week.*—Ganjam, a town about 8 miles from Mysore City, experienced a severe hailstorm resulting in serious loss both to property and standing crops. Roofs of huts and even of tiled houses were smashed. Following the storm there was a heavy downpour of rain accompanied by strong winds.

*August 7th.*—Considerable damage to houses and property was caused by a storm which passed over Lahore Cantonment uprooting trees, bringing down electric wires and even blowing the tiled roofs of several buildings. No loss of human life was reported, but a number of cattle was either killed or injured.

*August 9th.*—A huge banyan tree at Bazi Hat (Chittagong) was struck by lightning. The tree was rent asunder and the Imam of a mosque close by fainted owing to the shock.

*August 11th.*—At Thanatpui, 7 miles east of Pegu, near the jetty of the Pegu Sittang canal, a water spout was observed. A " Sampan " which was moored along the jetty was hurled 12 feet into the air and fell on the road nearby. A man who was in the " Sampan " saved his life by jumping into the water. A few houses and trees were blown down by strong winds which heralded the approach of the water spout.

*August 2nd week.*—A severe storm passed over several villages in Noakhali district causing serious damages to property. There was no loss of life.

*September 9th.*—A tornado accompanied by thunder passed over Lantara, Panthar, Tepri, Narina (Shahzadpur), Lakshipur, Pirerchar, Satlathi and Saratail on the banks of the river Hurasagar (in Belkuchi, Pabna district) in the small hours of the morning. It is reported that most of the houses at Pirerchar and Satlathi have been razed to the ground and that several boats sank at Lantara Panthar.

*September 10th.*—At about 10 P.M. on September 10th, a violent tornado burst is reported to have swept over a large

part of Brahmanbaria sub-division (Tipperah district) causing considerable damage. Several boats capsized.

*September 18th.*—A storm broke over Jenangyaung oil-field area (near Rangoon). Trees were uprooted and the roofs of huts along the river were blown off. A motor boat was carried away by a strong current while crossing a shallow part of the river and a Burman coolie was drowned.

*October 5th.*—A severe thunderstorm passed over Bombay City in the evening. The force of wind was so great that in some parts of the city trees were uprooted and window panes were smashed. Dense clouds of dust rose, temporarily blinding the pedestrians, and drivers of vehicles found great difficulty along the roads. The duststorm was closely followed by a heavy shower of rain lasting for nearly half an hour.

*October 6th.*—Two men were killed and 11 injured as a result of a storm which passed over Heho districts in Shan States and lasted for about a quarter of an hour. Considerable damage was done to property in a village named Kyaukphtap.

5 men of village Barkal in Chittagong district were struck by lightning. Four of them died simultaneously and the fifth was found unconscious.

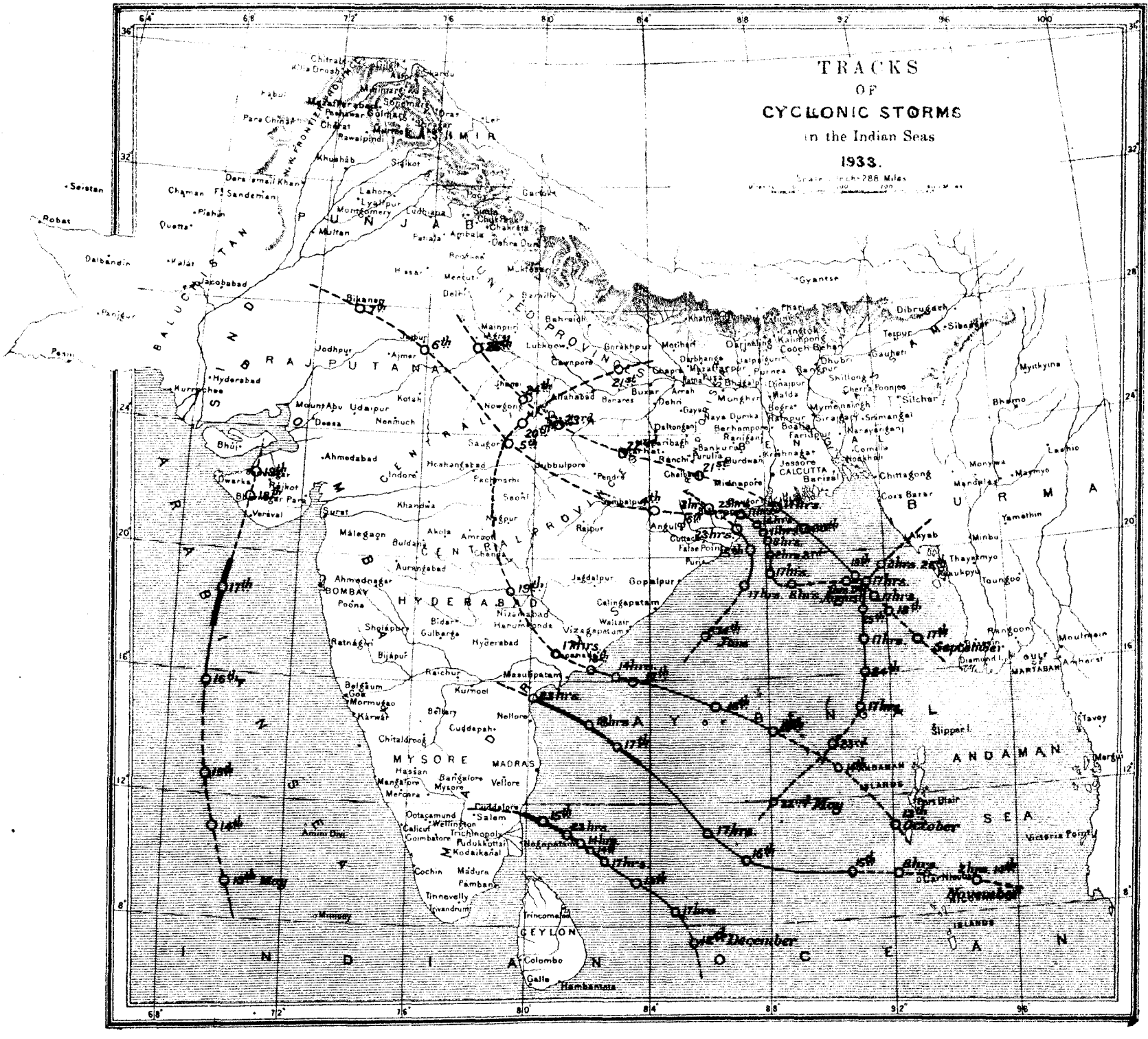
*October 13th.*—A violent rainstorm swpet over Calcutta at noon. The street and alleys were under knee-deep water. Traffic in many parts of Calcutta was brought to a standstill and all sorts of normal business in the city was suspended for several hours.

## WINDS OF FORCE NINE OR MORE IN INDIAN SEAS.

Excluding dates of storms and depressions, a description of which has been given above, winds of force nine or more were recorded on ships in the Indian seas during the year 1933 on the following occasions :—

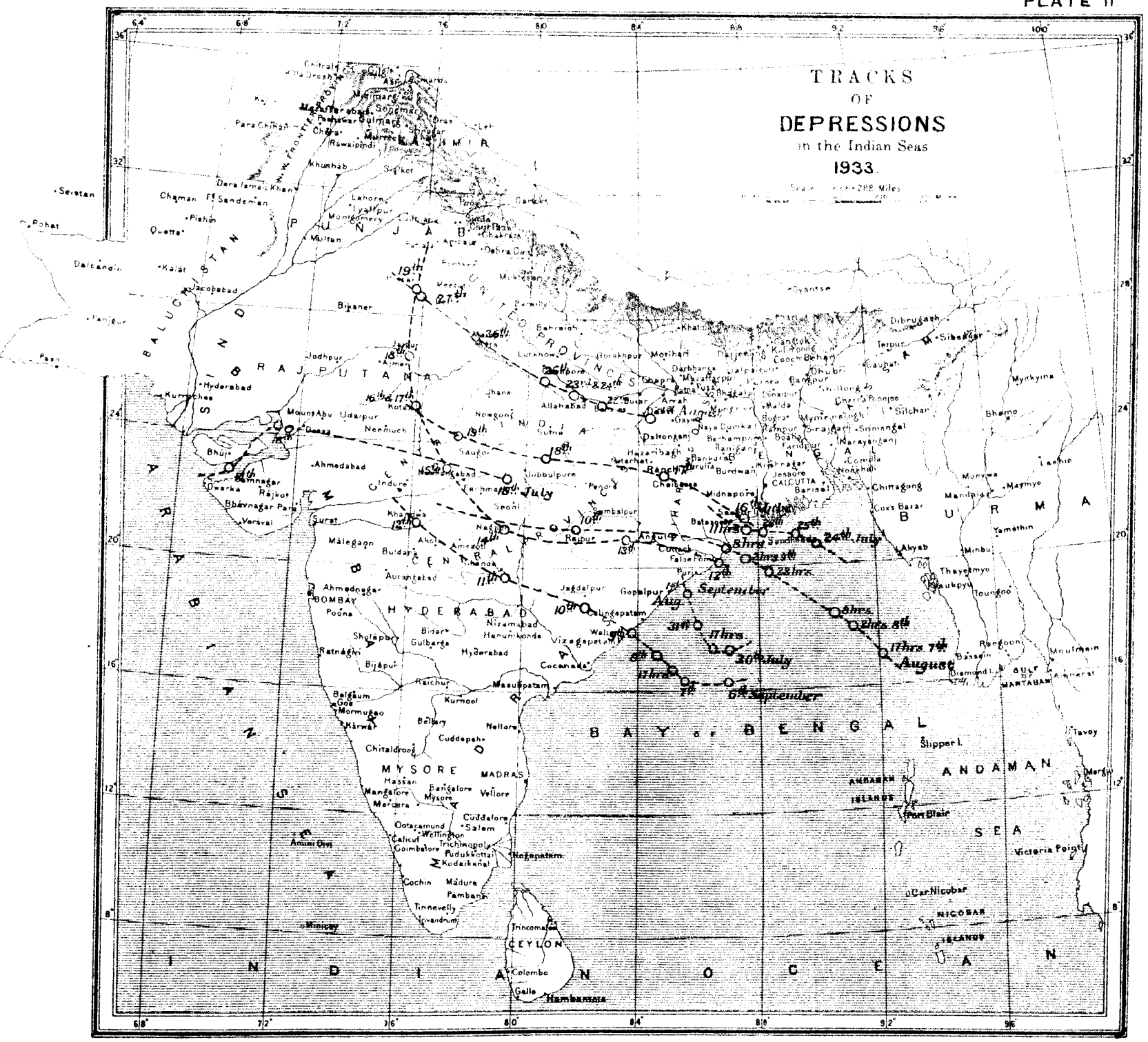
| Date. | Name of ship. | Approximate Position. | | | |
|---|---|---|---|---|---|
| | | Lat. N. | | Long. E. | |
| | | ° | ′ | ° | ′ |
| 9th May | "Sikh" | 11 | 00 | 75 | 00 |
| 16th May | "City of Swansea" | 17 | 17 | 67 | 68 |
| 16th and 17th May | "Bhutan" | 18 | 17 | 69 | 68 |
| 11th June | "Talma" | 10 | 08 | 96 | 00 |
| 19th June | "Gairsoppa" | 11 | 00 | 67 | 00 |
| 21st June | "Taiwar" | 15 | 05 | 89 | 00 |
| 21st July | "M.V. Jenny" | 16 | 00 | 61 | 00 |
| 1st to 4th August | "Nurjehan" | 18 | 17 | 65 | 60 |
| 2nd to 4th August | "Contractor" | 11 | 10 | 53 | 58 |
| 8th and 9th August | "Marionfels" | 12 | 12 | 54 | 57 |
| 14th and 15th August | "Pasha" | 20 | 21 | 69 | 68 |
| 22nd November | "Badarpur" | 10 | 05 | 87 | 02 |
| 7th December | "Winkfield" | 12 | 00 | 84 | 00 |

MGIPC—M—VIII-3-170—13-3-35—160.




Reg. No. 3590 E 24.

Depression — Storm — Severe Storm.




Reg. No. 3580 E 24.

# INDIA WEATHER REVIEW, 1933.

## ANNUAL SUMMARY.

# PART D.

## SEISMIC RECORDS.

### STATION—AGRA.

$\varphi = 27° 8' 15''$ N ; $\lambda = 78° 0' 45''$ E ; $h = 163$ metres. *Subsoil*—Indo-Gangetic Alluvium.

*Apparatus.*—One Omori-Ewing Horizontal Pendulum Seismograph giving $A_N$ (Mass 50 Kg.).

One Milne-Shaw Seismograph giving $A_E$. (Damping ratio 20 : 1).

TABLE D 1.

| | V | T | ε | Remarks. |
|---|---|---|---|---|
| Omori—$A_N$ . . . . . | 28·2 | 29·4 | 1 | |
| Milne-Shaw—$A_E$ . . . . . | 783 | 12 | ... | From 1st January 1933 to 5th January 1933. |
| | 736 | 12 | .. | From 6th January 1933 to 5th July 1933. |
| | 714 | 12 | ... | From 6th July 1933 to 14th September 1933. |
| | 633 | 12 | ... | From 15th September 1933 to 26th December 1933. |
| | 614 | 12 | ... | Form 27th December 1933 to 31st December 1933. |

| Date. | Phase. | Time G. M. T. | Period (Sec.). | Amplitude (μ) $A_N$ | Amplitude (μ) $A_E$ | Remarks. |
|---|---|---|---|---|---|---|
| 1933. | | H. M. S. | | | | |
| Jan. 1st | $A_E$ P | 9 2 9 | ... | ... | ... | Slight shock. |
| | S | 9 6 17 | ... | ... | ... | |
| | F | 10 25 49 | ... | ... | ... | |
| ,, 3rd | $A_E$ P | 15 36 45 | ... | ... | ... | Do. |
| | S | 15 44 20 | ... | ... | ... | |
| | Le | 15 56 8 | ... | ... | ... | |
| | M | 16 2 9 | 13 | ... | 4 | |
| | F | 16 42 20 | ... | ... | ... | |
| ,, 9th | $A_E$ P | 2 4 23 | ... | ... | ... | Shock of great intensity. |
| | F | 8 37 24 | ... | ... | ... | |
| ,, 9th | $A_N$ P | 2 4 25 | ... | ... | ... | Do. |
| | Se | 2 6 18 | ... | ... | ... | |
| ,, 17th | $A_E$ P | 16 4 35 | ... | ... | ... | Slight shock. |
| | S | 16 8 19 | ... | ... | ... | |
| | M | 16 14 2 | 7 | ... | 2 | |
| | F | 16 30 58 | ... | ... | ... | |
| ,, 17th | $A_E$ e | 19 6 46 | ... | ... | ... | Do. |
| | M | 19 23 27 | 16 | ... | 4 | |
| | F | 20 12 6 | ... | ... | ... | |
| ,, 17th | $A_E$ e | 22 21 24 | ... | ... | ... | Feeble shock. |
| | F | 22 47 44 | ... | ... | ... | |
| ,, 21st | $A_E$ P | 19 31 52 | ... | ... | ... | Shock of very great intensity. |
| | F | 23 28 34 | ... | ... | ... | |
| 1933. | | H. M. S. | | | | |
| Jan. 21st | $A_N$ P | 19 31 55 | ... | ... | ... | Shock of great intensity. |
| | S | 19 40 24 | ... | ... | ... | |
| | Le | 19 52 45 | ... | ... | ... | |
| ,, 21st | $A_N$ M | 19 54 20 | 22 | 720 | ... | |
| | F | 22 28 53 | ... | ... | ... | |
| ,, 27th | $A_E$ P | 22 56 22 | ... | ... | ... | Feeble shock. |
| | M | 23 6 32 | 15 | ... | 3 | |
| | F | Lost while changing chart. | | | | |
| Feb. 3rd | $A_E$ P | 22 21 55 | ... | ... | ... | Slight shock. |
| | S | 22 29 57 | ... | ... | ... | |
| | L | 22 42 48 | ... | ... | ... | |
| | F | 23 48 23 | ... | ... | ... | |
| ,, 13th | $A_E$ P | 2 53 58 | ... | ... | ... | Moderate shock. |
| | S | 2 57 51? | ... | ... | ... | |
| ,, 13th | $A_N$ P | 2 53 59 | ... | ... | ... | Slight shock. |
| | S | 2 57 57 | ... | ... | ... | |
| | F | 3 36 59 | ... | ... | ... | |
| ,, 16th | $A_E$ e | 9 24 41 | ... | ... | ... | Very feeble shock. |
| | F | 10 3 42 | ... | ... | ... | |
| 1933. | | H. M. S. | | | | |
| Feb. 21st | $A_E$ P | 19 7 20 | ... | ... | ... | Slight shock. |
| | S | 19 10 57 | ... | ... | ... | |
| | L | 19 12 56 | ... | ... | ... | |
| | F | 20 6 57 | ... | ... | ... | |
| ,, 21st | $A_N$ eP | 19 7 22 | ... | ... | ... | Feeble shock. |
| | F | 19 28 35 | ... | ... | ... | |
| ,, 23rd | $A_E$ P | 8 29 1 | ... | ... | ... | Moderate shock. |
| | eF | 11 40 32 | ... | ... | ... | |
| ,, 23rd | $A_N$ eP | 8 29 22 | ... | ... | ... | Do. |
| Mar. 2nd | $A_E$ P | 17 40 34 | ... | ... | ... | Shock of very great intensity. |
| | eF | 23 34 55 | ... | ... | ... | |
| ,, 2nd | $A_N$ P | 17 40 45 | ... | ... | ... | Do. |
| | S | 17 48 36 | ... | ... | ... | |
| | L | Uncertain | ... | ... | ... | |
| | M | ? | ? | >1010 | ... | Motion of recording pen restricted due to side-stops at intervals for about 25 minutes. |
| | F | 22 26 13 | ... | ... | ... | |

TABLE D 1—*contd.*

| Date. | Phase. | Time G. M. T. | Period (Sec.) | Amplitude (μ) $A_N$ | Amplitude (μ) $A_E$ | Remarks. |
|---|---|---|---|---|---|---|
| 1933. | | H. M. S. | | | | |
| Mar. 3rd | $A_E$ P | 9 22 20 | ... | ... | ... | Slight shock. |
| | Se | 9 29 53 | ... | ... | ... | |
| ,, 6th | $A_E$ P | 13 8 11 | ... | ... | ... | Do. |
| | eF | 14 10 3 | ... | ... | ... | |
| ,, 6th | $A_N$ eP | 13 8 3 | ... | ... | ... | Do. |
| | S | 13 10 2 | ... | ... | ... | |
| | L | 13 11 16 | ... | ... | ... | |
| | F | 13 34 1 | ... | ... | ... | |
| ,, 11th | $A_E$ P | 14 31 55 | ... | ... | ... | Do. |
| | S | 14 39 55 | ... | ... | ... | |
| | L | 14 52 13 | ... | ... | ... | |
| | F | 16 23 1 | ... | ... | ... | |
| ,, 11th | $A_E$ P | 19 41 26 | ... | ... | ... | Do. |
| | eS | 19 48 22 | ... | ... | ... | |
| | F | 21 13 46 | ... | ... | ... | |
| ,, 17th | $A_E$ P | 16 5 59 | ... | ... | ... | Shock of great intensity. |
| | S | 16 14 34 | ... | ... | ... | |
| | L | 16 28 35 | ... | ... | ... | |
| | F | 16 58 16 | ... | ... | ... | |
| ,, 17th | $A_N$ eP | 16 6 1 | ... | ... | ... | Moderate shock. |
| | Se | 16 14 58 | ... | ... | ... | |
| ,, 17th | $A_E$ P | 19 41 25 | ... | ... | ... | Do. |
| | S | 19 48 33 | ... | ... | ... | |
| | L | 19 58 44 | ... | ... | ... | |
| | Fe | 21 40 37 | ... | ... | ... | |
| ,, 17th | $A_N$ eP | 19 41 32 | ... | ... | ... | Do. |
| | Se | 19 48 44 | ... | ... | ... | |
| | M | 20 4 9 | 20 | 29 | ... | |
| | eF | 21 7 49 | ... | ... | ... | |
| ,, 23rd | $A_E$ P | 17 44 31 | ... | ... | ... | Slight shock. |
| | F | 19 0 8 | ... | ... | ... | |
| ,, 31st | $A_E$ P | 22 3 56 | ... | ... | ... | Do. |
| | S | 22 7 29 | ... | ... | ... | |
| | L | 22 10 6 | ... | ... | ... | |
| | M | 22 12 14 | 10 | ... | 5 | |
| | F | 22 41 11 | ... | ... | ... | |
| Apr. 1st | $A_E$ P | 16 8 31 | ... | ... | ... | Do. |
| | S | 16 16 10 | ... | ... | ... | |
| | L | 16 27 11 | ... | ... | ... | |
| | M | 16 34 16 | 15 | ... | 4 | |
| | F | 17 14 57 | ... | ... | ... | |
| 1933. | | H. M. S. | | | | |
| Apr. 9th | $A_E$ P | 2 56 11 | ... | ... | ... | Moderate shock. |
| | S | 3 3 57 | ... | ... | ... | |
| | L | 3 15 58 | ... | ... | ... | |
| ,, 9th | $A_N$ e | 2 58 20 | ... | ... | ... | Slight shock. |
| | M | 3 21 22 | 19 | 43 | ... | |
| | F | 3 47 41 | ... | ... | ... | |
| ,, 16th | $A_E$ P | 19 27 23 | ... | ... | ... | Feeble shock. |
| | S | 19 36 9 | ... | ... | ... | |
| | L(?) | 19 51 38 | ... | ... | ... | |
| | Fe | 20 54 55 | ... | ... | ... | |
| ,, 19th | $A_N$ e | 6 52 21 | ... | ... | ... | Moderate shock. |
| | Se | 6 58 6 | ... | ... | ... | |
| | M | 7 7 35 | 21 | 69 | ... | |
| | eF | 8 18 20 | ... | ... | ... | |
| ,, 23rd | $A_E$ P | 6 5 39 | ... | ... | ... | Do. |
| | S | 6 12 16 | ... | ... | ... | |
| | F | Mixed up with the next shock. | | | | |
| ,, 23rd | $A_N$ e | 6 5 41 | ... | ... | ... | Do. |
| | S | 6 12 10 | ... | ... | ... | |
| | L | 6 19 40 | ... | ... | ... | |
| | M | 6 23 40 | 19 | 59 | ... | |
| | F | 6 57 38 | ... | ... | ... | |
| ,, 23rd | $A_E$ Pe | 7 23 16 | ... | ... | ... | Do. |
| | S | 7 30 57 | ... | ... | ... | |
| | L | 7 42 26 | ... | ... | ... | |
| | F | 9 35 58 | ... | ... | ... | |
| ,, 23rd | $A_N$ eP | 7 23 16 | ... | ... | ... | Do. |
| | S | 7 31 2 | ... | ... | ... | |
| | Le | 7 42 11 | ... | ... | ... | |
| ,, 27th | $A_E$ P | 2 48 36 | ... | ... | ... | Shock of great intensity. |
| | S | 2 58 52 | ... | ... | ... | |
| | Fe | 6 26 4 | ... | ... | ... | |
| ,, 27th | $A_N$ P | 2 48 46 | ... | ... | ... | Do. |
| | S | 2 58 55 | ... | ... | ... | |
| | M | 3 31 45 | 19 | 225 | ... | |
| | F | 5 19 35 | ... | ... | ... | |
| ,, 27th | $A_E$ P | 12 9 2 | ... | ... | ... | Slight shock. |
| | S | 12 18 17 | ... | ... | ... | |
| | F | 13 47 32 | ... | ... | ... | |
| 1933. | | H. M. S. | | | | |
| May 1st | $A_E$ $P_c$ | 20 1 8 | ... | ... | ... | Slight shock |
| | S | 20 9 9 | ... | ... | ... | |
| | Le | 20 21 33 | ... | ... | ... | |
| | M | 20 28 54 | 16 | ... | 4 | |
| | F | 21 30 11 | ... | ... | ... | |
| ,, 11th | $A_E$ P | 19 18 16 | ... | ... | ... | Do. |
| | eS | 19 24 49 | ... | ... | ... | |
| | M | 19 40 38 | 15 | ... | 6 | |
| | F | 20 47 23 | ... | ... | ... | |
| ,, 12th | $A_E$ P | 16 14 48 | ... | ... | ... | Feeble shock. |
| | S | 16 18 24 | ... | ... | ... | |
| | Fe | 16 52 33 | ... | ... | ... | |
| ,, 16th | $A_E$ P | 1 18 8 | ... | ... | ... | Shock of great intensity |
| | S | 1 22 49 | ... | ... | ... | |
| | Le | 1 27 15 | ... | ... | ... | |
| | Fe | 3 29 37 | ... | ... | ... | |
| ,, 16th | $A_N$ e | 1 18 44 | ... | ... | ... | Moderate shock. |
| | Se | 1 22 42 | ... | ... | ... | |
| | M | 1 33 51 | 20 | 96 | ... | |
| | F | 2 15 7 | ... | ... | ... | |
| June 2nd | $A_E$ eP | 7 47 9 | ... | ... | ... | Slight shock. |
| | Fe | 8 54 36 | ... | ... | ... | |
| ,, 3rd | $A_E$ P | 17 17 32 | ... | ... | ... | Do. |
| | Fe | 18 26 32 | ... | ... | ... | |
| ,, 3rd | $A_N$ e | 17 17 32 | ... | ... | ... | Feeble shock. |
| | Fe | 17 57 48 | ... | ... | ... | |
| ,, 6th | $A_E$ P | 2 36 12 | ... | ... | ... | Slight shock |
| | S | 2 42 10 | ... | ... | ... | |
| | Pe | 3 55 26 | ... | ... | ... | |
| ,, 6th | $A_N$ e | 2 36 34 | ... | ... | ... | Feeble shock. |
| | eS | 2 42 21 | ... | ... | ... | |
| | F | 3 10 42 | ... | ... | ... | |
| ,, 7th | $A_E$ P | 11 50 28 | ... | ... | ... | Moderate shock. |
| | Fe | 13 15 26 | ... | ... | ... | |
| ,, 7th | $A_N$ Pe | 11 50 37 | ... | ... | ... | Do. |
| | S | 11 54 13 | ... | ... | ... | |
| | L | 11 56 59 | ... | ... | ... | |
| | M | 11 57 43 | 19 | 138 | ... | |
| | F | 12 35 31 | ... | ... | ... | |

TABLE D 1—*contd.*

| Date. | Phase. | Time G. M. T. | Period (Sec.) | Amplitude (μ) $A_N$ | Amplitude (μ) $A_E$ | Remarks. |
|---|---|---|---|---|---|---|
| 1933. | | H. M. S. | | | | |
| June 8th | $A_E$ P | 18 20 16 | ... | ... | ... | Feeble shock. |
| | eF | 19 33 6 | ... | ... | ... | |
| ,, 13th | $A_E$ P | 20 43 1 | ... | ... | ... | Slight shock. |
| | S | 20 50 40 | ... | ... | ... | |
| | M | 21 10 18 | 15 | ... | 5 | |
| | Fe | 21 53 36 | ... | ... | ... | |
| ,, 18th | $A_E$ P | 22 42 32 | ... | ... | ... | Feeble shock. |
| | F | 23 48 45 | ... | ... | ... | |
| ,, 24th | $A_E$ Pe | 22 2 31 | ... | ... | ... | Shock of very great intensity |
| ,, 25th | eF | 1 56 23 | ... | ... | ... | |
| ,, 24th | $A_N$ P | 22 2 40 | ... | ... | ... | Do. |
| | eS | 22 8 52 | ... | ... | ... | |
| | M | ? | ? | >986 | | Motion of recording pen restricted due to side-stops at intervals for about 5 minutes. |
| | F | Lost while changing chart. | | | | |
| July 3rd | $A_E$ P | 15 13 21 | ... | ... | ... | Feeble shock. |
| | F | 15 49 31 | ... | ... | ... | |
| ,, 7th | $A_E$ P | 7 33 51 | ... | ... | ... | Do. |
| | Fe | 8 20 14 | ... | ... | ... | |
| ,, 9th | $A_N$ eP | 1 40 4 | ... | ... | ... | Moderate shock. |
| | S | 1 48 6 | ... | ... | ... | |
| ,, 9th | $A_N$ P | 12 40 42 | ... | ... | ... | Do. |
| | S | 12 48 51 | ... | ... | ... | |
| | eL | 13 1 54 | ... | ... | ... | |
| | M | 13 8 42 | 17 | 87 | ... | |
| | Fe | 14 22 58 | ... | ... | ... | |
| ,, 22nd | $A_E$ P | 21 7 15 | ... | ... | ... | Do. |
| | S | 21 17 23 | ... | ... | ... | |
| | F | Lost while changing chart. | | | | |
| ,, 22nd | $A_N$ eP | 21 7 12 | ... | ... | ... | Do. |
| | Se | 21 17 24 | ... | ... | ... | |
| | M | 21 46 7 | 19 | 53 | ... | |
| | Fe | 22 44 26 | ... | ... | ... | |
| Aug. 11th | $A_E$ P | 8 58 14 | ... | ... | ... | Do. |
| | Fe | 10 34 32 | ... | ... | ... | |
| 1933. | | H. M. S. | | | | |
| Aug. 11th | $A_N$ Pe | 8 58 24 | ... | ... | ... | Moderate Shock. |
| | S | 9 1 44 | ... | ... | ... | |
| | L | 9 3 55 | ... | ... | ... | |
| | Fe | 9 31 58 | ... | ... | ... | |
| ,, 12th | $A_E$ e | 7 36 47 | ... | ... | ... | Very feeble shock. |
| | M | 7 41 52(?) | 11 | ... | 3 | |
| | F | 8 2 33 | ... | ... | ... | |
| ,, 13th | $A_E$ P | 9 38 34 | ... | ... | ... | Slight shock. |
| | S | 9 47 0 | ... | ... | ... | |
| | F | 11 8 56 | ... | ... | ... | |
| ,, 13th | $A_N$ Pe | 9 38 41 | ... | ... | ... | Very feeble shock. |
| | Se | 9 47 9 | ... | ... | ... | |
| | Fe | 15 52 15 | ... | ... | ... | |
| ,, 14th | $A_E$ P | 22 20 40 | ... | ... | ... | Feeble shock. |
| | F | 22 49 7 | ... | ... | ... | |
| ,, 25th | $A_E$ P | 7 55 26 | ... | ... | ... | Shock of very great intensity. |
| | F | Not determinable. | | | | |
| ,, 25th | $A_N$ P | 7 55 29 | ... | ... | ... | Do. |
| | S | 7 59 42 | ... | ... | ... | |
| | L | 8 2 25 | ... | ... | ... | |
| | M | ? | ? | >1025 | | Motion of recording pen restricted due to side-stops for about 5 minutes. |
| | F | 9 46 18 | ... | ... | ... | |
| ,, 29th | $A_E$ eP | 15 11 4 | ... | ... | ... | Very feeble shock. |
| | Fe | 16 14 4 | ... | ... | ... | |
| Sept. 24th | $A_E$ P | 15 31 35 | ... | ... | ... | Moderate shock. |
| | S | 15 41 44 | ... | ... | ... | |
| | L | 16 1 33 | ... | ... | ... | |
| | M | 16 9 59 | 20 | ... | 18 | |
| | F | 17 5 36 | ... | ... | ... | |
| ,, 25th | $A_E$ P | 13 54 41 | ... | ... | ... | Feeble shock. |
| | F | 14 53 11 | ... | ... | ... | |
| ,, 25th | $A_E$ P | 18 54 34 | ... | ... | ... | Moderate shock. |
| | F | 20 57 47 | ... | ... | ... | |
| ,, 25th | $A_N$ Pe | 18 54 36 | ... | ... | ... | Slight shock. |
| | F | 19 46 47 | ... | ... | ... | |
| 1933. | | H. M. S. | | | | |
| Sept. 30th | $A_E$ P | 14 32 1 | ... | ... | ... | Slight shock. |
| | S | 14 41 37 | ... | ... | ... | |
| | L | 14 54 33 | ... | ... | ... | |
| | eF | 16 6 22 | ... | ... | ... | |
| Oct. 2nd | $A_E$ P | 15 49 12 | ... | ... | ... | Moderat shock. |
| | M | 17 2 51 | 20 | ... | 15 | |
| | F | 18 20 9 | ... | ... | ... | |
| ,, 2nd | $A_N$ e | 15 49 6 | ... | ... | ... | Slight shock. |
| | F | 17 46 48 | ... | ... | ... | |
| ,, 5th | $A_E$ P | 13 34 12 | ... | ... | ... | Moderate shock. |
| | Fe | 15 16 31 | ... | ... | ... | |
| ,, 5th | $A_N$ P | 13 34 17 | ... | ... | ... | Do. |
| | S | 13 37 49 | ... | ... | ... | |
| | eL | 13 39 42 | ... | ... | ... | |
| | M | 13 41 10 | 22 | 381 | ... | |
| | F | 14 10 56 | ... | ... | ... | |
| ,, 14th | $A_E$ eP | 22 31 28 | ... | ... | ... | Slight shock. |
| | Se | 22 41 49 | ... | ... | ... | |
| | Le | 23 1 59 | ... | ... | ... | |
| | Fe | 23 42 26 | ... | ... | ... | |
| ,, 16th | $A_N$ P | 4 37 27 | ... | ... | ... | Do. |
| | F | 5 5 35 | ... | ... | ... | |
| ,, 21st | $A_E$ e | 2 53 54 | ... | ... | ... | Feeble shock. |
| | Se | 3 1 28 | ... | ... | ... | |
| | L | 3 14 20 | ... | ... | ... | |
| | Fe | 3 57 33 | ... | ... | ... | |
| ,, 22nd | $A_E$ e | 14 6 22 | ... | ... | ... | Slight shock |
| | F | 14 30 18 | ... | ... | ... | |
| Nov. 2nd | $A_E$ P | 12 38 57 | ... | ... | ... | Moderate shock. |
| | S | 12 49 2 | ... | ... | ... | |
| | M | 13 17 29 | 20 | ... | 15 | |
| | eF | 15 1 53 | ... | ... | ... | |
| ,, 5th | $A_E$ P | 20 31 22 | ... | ... | ... | Slight shock. |
| | S | 20 35 0 | ... | ... | ... | |
| | Le | 20 37 12 | ... | ... | ... | |
| | Fe | 21 24 34 | ... | ... | ... | |
| ,, 7th | $A_N$ e | 11 16 20 | ... | ... | ... | Tremors. |
| | Fe | 11 26 54 | ... | ... | ... | |

TABLE D 1—*concld.*

| Date. | Phase. | Time G. M. T. | Period (Sec.) | Amplitude (μ) $A_N$ | Amplitude (μ) $A_E$ | Remarks. |
|---|---|---|---|---|---|---|
| 1933. | | H. M. S. | | | | |
| | $A_E$ | | | | | |
| Nov. 19th | P | 9 12 31 | ... | ... | ... | Slight shock. |
| | S | 9 15 55 | ... | ... | ... | |
| | eL | 9 18 48 | ... | ... | ... | |
| | M | 9 21 36 | 10 | ... | 4 | |
| | F | 9 45 25 | ... | ... | ... | |
| | $A_E$ | | | | | |
| „ 20th | P | 23 33 31 | ... | ... | ... | Shock of great intensity. |
| „ 21st | F | 3 8 29 | ... | ... | ... | |
| | $A_N$ | | | | | |
| „ 20th | P | 23 33 33 | ... | ... | ... | Do. |
| | S | 23 43 22 | ... | ... | ... | |
| | $A_N$ | | | | | |
| „ 21st | L | 0 1 53 | ... | ... | ... | |
| | M | 0 5 2 | 28 | 648 | ... | |
| | F | Lost while changing chart. | | | | |
| | $A_E$ | | | | | |
| „ 22nd | Pe | 12 54 15 | ... | ... | ... | Moderate shock. |
| | S | 13 4 4 | ... | ... | ... | |
| | M | 13 28 42 | ... | ... | ... | |
| | $A_E$ | | | | | |
| „ 28th | P | 11 13 46 | ... | ... | ... | Shock of great intensity. |
| | F | 12 59 38 | ... | ... | ... | |

| Date. | Phase. | Time G. M. T. | Period (Sec.) | Amplitude (μ) $A_N$ | Amplitude (μ) $A_E$ | Remarks. |
|---|---|---|---|---|---|---|
| 1933. | | H. M. S. | | | | |
| | $A_N$ | | | | | |
| Nov. 28th | eP | 11 13 52 | ... | ... | ... | Shock of great intensity. |
| | S | 11 17 27 | ... | ... | ... | |
| | L | 11 19 35 | ... | ... | ... | |
| | M | 11 21 22 | 20 | 696 | ... | |
| | eF | 12 28 58 | ... | ... | ... | |
| | $A_E$ | | | | | |
| „ 28th | e | 16 11 35 | ... | ... | ... | Feeble shock. |
| | M | 16 17 23 | 9 | ... | 3 | |
| | F | 16 35 35 | ... | ... | ... | |
| | $A_E$ | | | | | |
| Dec. 2nd | P | 2 18 12 | ... | ... | ... | Slight shock. |
| | S | 2 20 8 | ... | ... | ... | |
| | F | 2 52 58 | ... | ... | ... | |
| | $A_E$ | | | | | |
| „ 9th | P | 7 54 45 | ... | ... | ... | Do. |
| | F | 8 31 26 | ... | ... | ... | |
| | $A_N$ | | | | | |
| „ 9th | eP | 7 54 45 | ... | ... | ... | Feeble shock. |
| | S | 7 56 50 | ... | ... | ... | |
| | Le | 7 58 0 | ... | ... | ... | |

| Date. | Phase. | Time G. M. T. | Period (Sec.). | Amplitude (μ) $A_N$ | Amplitude (μ) $A_E$ | Remarks. |
|---|---|---|---|---|---|---|
| 1933. | | H. M. S. | | | | |
| | $A_E$ | | | | | |
| Dec. 12th | P | 5 26 6 | ... | ... | ... | Slight shock. |
| | S | 5 29 49 | ... | ... | ... | |
| | $A_E$ | | | | | |
| „ 12th | L | 5 32 33 | ... | ... | ... | |
| | M | 5 35 38 | 10 | ... | 5 | |
| | F | 5 53 53 | ... | ... | ... | |
| | $A_E$ | | | | | |
| „ 12th | P | 14 23 17 | ... | ... | ... | Feeble shock. |
| | Fe | 15 44 46 | ... | ... | ... | |
| | $A_E$ | | | | | |
| „ 14th | P | 18 56 18 | ... | ... | ... | Slight shock. |
| | S | 19 0 6 | ... | ... | ... | |
| | L | 19 2 56 | ... | ... | ... | |
| | F | 19 36 28 | ... | ... | ... | |
| | $A_N$ | | | | | |
| „ 14th | eP | 18 56 6 | ... | ... | ... | Do. |
| | S | 19 0 6 | ... | ... | ... | |
| | $A_E$ | | | | | |
| „ 24th | P | 10 57 34 | ... | ... | ... | Do. |
| | S | 11 7 0 | ... | ... | ... | |
| | F | 12 14 1 | ... | ... | ... | |

Owing to irregular behaviour of the time-marking clock of the Seismographs, from July to November 1933, the values of the time of occurrence of the various phases for the shocks recorded during this period *may* be uncertain, the maximum discrepancy being estimated to be ± 20 seconds.

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# STATION—COLABA, BOMBAY.

$\varphi = 18° 54'$ N.; $\lambda = 72° 49'$ E.; $h = 6$ metres. *Subsoil*—Trap-rock.

*Apparatus.*—1. Milne-Shaw Seismograph ($A_N$—North-South Component).

2. Milne-Shaw Seismograph ($A_E$ East-West Component).

(In the underground constant temperature room.)

TABLE D 2.

| | Vm | T | ε |
|---|---|---|---|
| $A_N$ | 250 | 12 sec. | 20 : 1 |
| $A_E$ | 350 | 12 sec. | 22 : 1 |

| Date. | Phase. | Time G. M. T. | Period (Sec.) | Amplitude (μ) $A_N$ | Amplitude (μ) $A_E$ | Distance (Km.) | Remarks. |
|---|---|---|---|---|---|---|---|
| 1933. | | H. M. S. | | | | | |
| Jan. 1st | $A_N$ P | 9 2 11 | ... | ... | ... | 9390 | Slight. Epc :—Near Solomon Islands. L-waves poorly developed. |
| | S | 9 12 39 | ... | ... | ... | ... | |
| | M | Movements small. | | | | | |
| | F | 11 3 0 | ... | ... | ... | ... | |
| ,, 1st | $A_E$ P | 9 2 11 | ... | ... | ... | 9390 | Do. |
| | S | 9 12 39 | ... | ... | ... | ... | |
| | M | Movements | | small. | | | |
| | F | 11 9 0 | ... | ... | ... | ... | |
| ,, 3rd | $A_N$ P | 15 37 38 | ... | ... | ... | 6890 | Slight. Epc :—Japan, near 40° 24′ N., 144° E. (C.M.O., Japan.) |
| | S | 15 46 9 | ... | ... | ... | ... | |
| | M | 16 8 46 | 13 | 4 | ... | ... | |
| | F | 16 47 0 | ... | ... | ... | ... | |
| ,, 3rd | $A_E$ P | 15 37 38 | ... | ... | ... | 6890 | Do. |
| | S | 15 46 9 | ... | ... | ... | ... | |
| | M | 16 7 45 | 13 | ... | 3 | ... | |
| | F | 17 11 0 | ... | ... | ... | ... | |
| ,, 4th | $A_N$ P | 1 35 33 | ... | ... | ... | 7090 | Slight. Epc :—Japan, near 25° 48′ N., 145° E. (C.M.O., Japan). |
| | S | 1 44 15 | ... | ... | ... | ... | |
| | F | 3 24 0 | ... | ... | ... | ... | |
| ,, 4th | $A_E$ P | 1 35 33 | ... | ... | ... | 7090 | Do. |
| | S | 1 44 15 | ... | ... | ... | ... | |
| | L | 1 58 51 | ... | ... | ... | ... | |
| | F | 3 32 0 | ... | ... | ... | ... | |
| ,, 4th | $A_N$ P | 4 12 44 | ... | ... | ... | 8840 | Slight. |
| | S | 4 22 48 | ... | ... | ... | ... | |
| | SR1 | 4 29 15 | ... | ... | ... | ... | |
| | F | 5 36 0 | ... | ... | ... | ... | |
| ,, 4th | $A_E$ P | 4 12 44 | ... | ... | ... | 8840 | Do. |
| | S | 4 22 48 | ... | ... | ... | ... | |
| | M | 4 52 13 | 18 | ... | 6 | ... | |
| | F | 5 33 0 | ... | ... | ... | ... | |
| ,, 4th | $A_N$ e | 8 56 0 | ... | ... | ... | ... | Tremors. |
| | f | 9 9 0 | ... | ... | ... | ... | |
| Jan. 4th | $A_E$ e | 8 56 0 | ... | ... | ... | ... | Tremors. |
| | f | 9 9 0 | ... | ... | ... | ... | |
| ,, 5th | $A_N$ e | 1 33 0 | ... | ... | ... | ... | Do. |
| | f | 2 3 0 | ... | ... | ... | ... | |
| ,, 5th | $A_E$ e | 1 33 0 | ... | ... | ... | ... | Do. |
| | f | 2 4 0 | ... | ... | ... | ... | |
| ,, 6th | $A_N$ e | 19 33 0 | ... | ... | ... | ... | Do. |
| | f | 20 19 0 | ... | ... | ... | ... | |
| ,, 6th | $A_E$ e | 19 33 0 | ... | ... | ... | ... | Do. |
| | f | 20 17 0 | ... | ... | ... | ... | |
| ,, 7th | $A_N$ P | 4 17 16 | ... | ... | ... | 7030 | Moderate shock. Epc :—Japan, near 40° 18′ N., 144° E. (C.M.O. Japan). |
| | S | 4 25 53 | ... | ... | ... | ... | |
| | L | 4 39 5 | ... | ... | ... | ... | |
| | M | 4 47 33 | 15 | 14 | ... | ... | |
| | F | 6 38 0 | ... | ... | ... | ... | |
| ,, 7th | $A_E$ P | 4 17 15 | ... | ... | ... | 7030 | Do. |
| | S | 4 25 54 | ... | ... | ... | ... | |
| | L | 4 39 5 | ... | ... | ... | ... | |
| | M | 4 47 54 | 15 | ... | 12 | ... | |
| | F | 7 13 0 | ... | ... | ... | ... | |
| ,, 7th | $A_N$ e | 8 25 0 | ... | ... | ... | ... | Tremors. |
| | f | 8 35 0 | ... | ... | ... | ... | |
| ,, 7th | $A_E$ e | 8 25 0 | ... | ... | ... | ... | Do. |
| | f | 8 35 0 | ... | ... | ... | ... | |
| ,, 8th | $A_E$ e | 6 40 0 | ... | ... | ... | ... | Do. |
| | f | 7 37 0 | ... | ... | ... | ... | |
| ,, 8th | $A_N$ e | 6 40 0 | ... | ... | ... | ... | Do. |
| | f | 7 35 0 | ... | ... | ... | ... | |
| ,, 8th | $A_E$ e | 15 27 0 | ... | ... | ... | ... | Do. |
| | f | 15 41 0 | ... | ... | ... | ... | |
| Jan. 8th | $A_E$ e | 15 27 0 | ... | ... | ... | ... | Tremors. |
| | f | 15 41 0 | ... | ... | ... | ... | |
| ,, 9th | $A_N$ P | 2 5 37 | ... | ... | ... | 1920 | Moderate Epc :—North-west Frontier near 34° 30′ N., 72° 30′ E. Felt strongly at Drosh, Cherat, Peshawar and Rawalpindi. |
| | S | 2 8 49 | ... | ... | ... | ... | |
| | L | 2 10 49 | ... | ... | ... | ... | |
| | M | 2 13 49 | 9 | 33 | ... | ... | |
| | F | 3 54 0 | ... | ... | ... | ... | |
| ,, 9th | $A_E$ P | 2 5 37 | ... | ... | ... | 1920 | Do. |
| | S | 2 8 49 | ... | ... | ... | ... | |
| | L | 2 10 49 | ... | ... | ... | ... | |
| | M | 2 11 12 | 8 | ... | 31 | ... | |
| | F | 3 55 0 | ... | ... | ... | ... | |
| ,, 9th | $A_N$ e | 8 50 0 | ... | ... | ... | ... | Tremors. |
| | f | 9 10 0 | ... | ... | ... | ... | |
| ,, 9th | $A_E$ e | 8 49 0 | ... | ... | ... | ... | Do. |
| | f | 9 8 0 | ... | ... | ... | ... | |
| ,, 10th | $A_N$ e | 3 40 0 | ... | ... | ... | ... | Do. |
| | f | 3 48 0 | ... | ... | ... | ... | |
| ,, 10th | $A_E$ e | 3 40 0 | ... | ... | ... | ... | Do. |
| | f | 3 49 0 | ... | ... | ... | ... | |
| ,, 14th | $A_N$ e | 5 25 0 | ... | ... | ... | ... | Do. |
| | f | 5 29 0 | ... | ... | ... | ... | |
| ,, 15th | $A_N$ e | 18 14 3 | ... | ... | ... | ... | Feeble. |
| | i | 18 23 29 | ... | ... | ... | ... | |
| | F | 19 23 0 | ... | ... | ... | ... | |
| ,, 15th | $A_E$ e | 18 14 3 | ... | ... | ... | ... | Do. |
| | i | 18 23 29 | ... | ... | ... | ... | |
| | F | 19 30 0 | ... | ... | ... | ... | |

TABLE D 2—*contd.*

| Date. | Phase. | Time G. M. T. | Period (Sec.) | Amplitude (μ) A N | Amplitude (μ) A E | Distance (Km.) | Remarks. |
|---|---|---|---|---|---|---|---|
| 1933. | | H. M. S. | | | | | |
| Jan. 17th | $A_N$ e | 0 57 0 | ... | ... | ... | ... | Tremors |
| | f | 1 5 0 | ... | ... | ... | ... | |
| | $A_E$ e | 0 57 0 | ... | ... | ... | ... | Do. |
| | f | 1 5 0 | ... | ... | ... | ... | |
| ,, 17th | $A_N$ e | 16 11 0 | ... | ... | ... | ... | Do. |
| | f | 16 35 0 | ... | ... | ... | ... | |
| | $A_E$ e | 16 11 0 | ... | ... | ... | ... | Do. |
| | f | 16 35 0 | ... | ... | ... | ... | |
| ,, 17th | $A_N$ P | 18 57 17 | ... | ... | ... | 5860 | Slight. |
| | S | 19 4 50 | ... | ... | ... | ... | |
| | eL | 19 16 14 | ... | ... | ... | ... | |
| | M | 19 18 6 | 17 | 5 | ... | ... | |
| | F | 20 22 0 | ... | ... | ... | ... | |
| | $A_E$ P | 18 57 17 | ... | ... | ... | 5860 | Do. |
| | S | 19 4 50 | ... | ... | ... | ... | |
| | eL | 19 16 14 | ... | ... | ... | ... | |
| | M | 19 18 41 | 15 | ... | 2 | ... | |
| | F | 20 24 0 | ... | ... | ... | ... | |
| ,, 17th | $A_N$ e | 22 20 43 | ... | ... | ... | ... | Feeble. |
| | i | 22 24 43 | ... | ... | ... | ... | |
| | F | 23 1 0 | ... | ... | ... | ... | |
| | $A_E$ e | 22 20 43 | ... | ... | .. | ... | Do. |
| | i | 22 24 43 | ... | ... | ... | ... | |
| | F | 23 1 0 | ... | ... | ... | ... | |
| ,, 18th | $A_N$ e | 18 44 0 | ... | ... | ... | ... | Tremors. |
| | f | 19 1 0 | ... | ... | ... | ... | |
| | $A_E$ e | 18 44 0 | ... | ... | ... | ... | Do. |
| | f | 19 4 0 | ... | ... | ... | ... | |
| ,, 20th | $A_N$ P | 12 16 7 | ... | ... | ... | 1920 | Slight. Epc. :— North-west Frontier, near that of the 9th January. |
| | S | 12 19 19 | ... | ... | ... | ... | |
| | F | 12 41 0 | ... | ... | ... | ... | |
| ,, 20th | $A_E$ P | 12 16 7 | ... | ... | ... | 1920 | Do. |
| | S | 12 19 19 | ... | ... | ... | ... | |
| | F | 12 42 0 | ... | ... | ... | ... | |
| ,, 21st | $A_N$ e | 16 30 0 | ... | ... | ... | ... | Tremors. |
| | f | 17 4 0 | ... | ... | ... | ... | |
| ,, 21st | $A_E$ e | 16 30 0 | ... | ... | ... | ... | Do. |
| | f | 17 8 0 | ... | ... | ... | ... | |

| Date. | Phase. | Time G. M. T. | Period (Sec.) | Amplitude (μ) A N | Amplitude (μ) A E | Distance (Km.) | Remarks. |
|---|---|---|---|---|---|---|---|
| 1933. | | H. M. S. | | | | | |
| Jan. 21st | $A_N$ P | 19 30 36 | ... | ... | ... | 6160 | Great. Epc. :— Indian Ocean, near 33°S., 58·5°E |
| | S | 19 38 25 | ... | ... | ... | ... | |
| | L | 19 45 59 | ... | ... | ... | ... | |
| | M | 19 51 29 | 18 | 286 | ... | ... | |
| | F | 23 11 0 | ... | ... | ... | ... | |
| ,, 21st | $A_E$ P | 19 30 36 | ... | ... | ... | 6160 | Do. |
| | S | 19 38 25 | ... | ... | ... | ... | |
| | L | 19 45 59 | ... | ... | ... | ... | |
| | M | 19 49 59 | 17 | ... | 168 | ... | |
| | F | 23 20 0 | ... | ... | ... | ... | |
| ,, 23rd | $A_N$ e | 0 15 0 | ... | ... | ... | ... | Tremors. |
| | f | 0 30 0 | ... | ... | ... | ... | |
| ,, 23rd | $A_E$ e | 0 15 0 | ... | ... | ... | ... | Do. |
| | f | 10 30 0 | ... | ... | ... | ... | |
| ,, 24th | $A_N$ e | 4 58 53 | ... | ... | ... | ... | Very feeble near shock. |
| | i | 4 59 28 | ... | ... | ... | ... | |
| | F | 5 15 0 | ... | ... | ... | ... | |
| ,, 24th | $A_E$ e | 4 58 53 | ... | ... | ... | ... | Do. |
| | i | 4 59 28 | ... | ... | ... | ... | |
| | F | 5 15 0 | ... | ... | ... | ... | |
| , 25th | $A_N$ e | 13 44 0 | ... | ... | ... | ... | Tremors. |
| | f | 14 3 0 | ... | ... | ... | ... | |
| ,, 25th | $A_E$ e | 13 44 0 | ... | ... | ... | ... | Do. |
| | f | 14 3 0 | ... | ... | ... | ... | |
| ,, 26th-27th. | $A_N$ e | 23 30 0 | ... | ... | ... | ... | Slight near shock. |
| | i | 23 31 50 | ... | ... | ... | ... | |
| | F | 0 2 0 | ... | ... | ... | ... | |
| ,, 26th-27th. | $A_E$ e | 23 30 0 | ... | ... | ... | ... | Do. |
| | ss i | 23 31 50 | ... | ... | ... | ... | |
| | F | 0 0 0 | ... | ... | ... | ... | |
| ,, 27th | $A_N$ e | 22 56 23 | ... | ... | ... | ... | Very feeble, very distant. |
| | F | 23 54 0 | ... | ... | ... | ... | |
| ,, 27th-28th. | $A_E$ e | 22 56 23 | ... | ... | ... | ... | Do. |
| | F | 0 3 0 | ... | ... | ... | ... | |
| ,, 29th | $A_N$ e | 18 23 0 | ... | ... | ... | ... | Tremors. |
| | f | 18 34 0 | ... | ... | ... | ... | |

| Date. | Phase. | Time G. M. T. | Period (Sec.) | Amplitude (μ) A N | Amplitude (μ) A E | Distance (Km.) | Remarks. |
|---|---|---|---|---|---|---|---|
| 1933. | | H. M. S. | | | | | |
| Jan 29th | $A_E$ e | 18 24 0 | ... | ... | ... | ... | Tremors |
| | f | 18 33 0 | ... | ... | ... | ... | |
| ,, 30th | $A_N$ e | 20 39 0 | ... | ... | ... | ... | Do. |
| | f | 20 57 0 | ... | ... | ... | ... | |
| ,, 30th | $A_E$ e | 20 39 0 | ... | ... | ... | ... | Do. |
| | f | 20 57 0 | ... | ... | ... | ... | |
| Feb. 3rd | $A_N$ P | 22 22 54 | ... | ... | ... | 7680 | Slight. Epc. :— Near Kurile Islands, 46°N., 151°E. (J. S. A.) |
| | S | 22 31 59 | ... | ... | ... | ... | |
| | L | 22 46 25 | ... | ... | ... | ... | |
| | M | 22 49 36 | 19 | 5 | ... | ... | |
| | F | 23 30 0 | ... | ... | ... | ... | |
| ,, 3rd | $A_E$ P | 22 22 54 | ... | ... | ... | 7680 | Do. |
| | S | 22 31 59 | ... | ... | ... | ... | |
| | L | 22 46 26 | ... | ... | ... | ... | |
| | M | 22 54 29 | 19 | ... | 4 | ... | |
| | F | 23 34 0 | ... | ... | ... | ... | |
| ,, 3rd | $A_N$ e | 11 25 0 | ... | ... | ... | ... | Tremors |
| | f | 11 41 0 | ... | ... | ... | ... | |
| ,, 3rd | $A_E$ e | 11 24 0 | ... | ... | ... | ... | Do. |
| | f | 11 46 0 | ... | ... | ... | ... | |
| ,, 5th | $A_N$ e | 4 30 0 | ... | ... | ... | ... | Feeble, near shock. |
| | f | 4 34 0 | ... | ... | ... | ... | |
| ,, 5th | $A_E$ e | 4 30 0 | ... | ... | ... | ... | Do. |
| | f | 4 34 0 | ... | ... | ... | ... | |
| ,, 9th | $A_N$ e | 15 46 0 | ... | ... | ... | ... | Tremors. |
| | f | 16 27 0 | ... | ... | ... | ... | |
| ,, 9th | $A_E$ e | 15 46 0 | ... | ... | ... | ... | Do. |
| | f | 16 37 0 | ... | ... | ... | ... | |
| ,, 10th | $A_N$ e | 14 15 0 | ... | ... | ... | ... | Do. |
| | f | 15 24 0 | ... | ... | ... | ... | |
| ,, 10th | $A_E$ e | 14 15 0 | ... | ... | ... | ... | Do. |
| | f | 15 31 0 | ... | ... | ... | ... | |
| ,, 13th | $A_N$ P | Lost while changing chart. | | | | | Moderate Epc. :— Gobi Desert, near 45° N. E. |
| | S | Do. | | | do. | | |
| | M | 3 9 29 | 8 | 15 | ... | 8240 | |
| | F | 4 28 0 | ... | ... | ... | ... | |

TABLE D 2—*contd.*

| Date. | Phase. | Time G. M. T. | Period (Sec.) | Amplitude (μ) $A_N$ | Amplitude (μ) $A_E$ | Distance (Km.) | Remarks. |
|---|---|---|---|---|---|---|---|
| 1933. | | H. M. S. | | | | | |
| Feb. 13th | P | 2 55 34 | ... | ... | ... | 3240 | Moderate Epc :— Gobi Desert, near 45° N. 89° E. |
| | S | 3 0 34 | ... | ... | ... | ... | |
| | M | 3 9 5 | 9 | ... | 14 | ... | |
| | F | Mixed up in the following tremors. | | | | | |
| ,, 13th | e | 4 34 0 | ... | ... | ... | ... | Tremors. |
| | f | 5 4 0 | ... | ... | ... | ... | |
| ,, 13th | e | 4 33 0 | ... | ... | ... | ... | Do. |
| | f | 4 59 0 | ... | ... | ... | ... | |
| ,, 14th | e | 13 49 0 | ... | ... | ... | ... | Do. |
| | f | 14 8 0 | ... | ... | ... | ... | |
| ,, 14th | e | 13 48 0 | ... | ... | ... | ... | Do. |
| | f | 14 0 0 | ... | ... | ... | ... | |
| ,, 16th | e | 9 17 0 | ... | ... | ... | ... | Do. |
| | f | 9 53 0 | ... | ... | ... | ... | |
| ,, 16th | e | 9 18 0 | ... | ... | ... | ... | Do. |
| | f | 10 2 0 | ... | ... | ... | ... | |
| ,, 19th | e | 4 41 0 | ... | ... | ... | ... | Do. |
| | f | 5 24 0 | ... | ... | ... | ... | |
| ,, 19th | e | 4 34 0 | ... | ... | ... | ... | Do. |
| | f | 5 36 0 | ... | ... | ... | ... | |
| ,, 20th | e | 11 40 0 | ... | ... | ... | ... | Do. |
| | f | 12 12 0 | ... | ... | ... | ... | |
| ,, 20th | e | 11 38 0 | ... | ... | ... | ... | Do. |
| | f | 12 8 0 | ... | ... | ... | ... | |
| ,, 21st | P | 19 6 54 | ... | ... | ... | 1960 | Feeble. |
| | S | 19 10 17 | ... | ... | ... | ... | |
| | M | 19 17 47 | 15 | 5 | ... | ... | |
| | F | 19 44 0 | ... | ... | ... | ... | |
| ,, 21st | P | 19 6 54 | ... | ... | ... | 1960 | Do. |
| | S | 19 10 17 | ... | ... | ... | ... | |
| | M | 19 16 2 | 14 | ... | 3 | ... | |
| | F | 19 49 0 | ... | ... | ... | ... | |
| ,, 22nd | P | 18 2 30 | ... | ... | ... | 2580 | Slight. |
| | S | 18 6 42 | ... | ... | ... | ... | |
| | L | 18 9 26 | ... | ... | ... | ... | |
| | M | 18 12 29 | 14 | 8 | ... | ... | |
| | F | 18 44 0 | ... | ... | ... | ... | |
| 1933. | | H. M. S. | | | | | |
| Feb. 22nd | P | 18 2 30 | ... | ... | ... | 2580 | Slight. |
| | S | 18 6 42 | ... | ... | ... | ... | |
| | L | 18 9 26 | ... | ... | ... | ... | |
| | M | 18 12 29 | 13 | ... | 4 | ... | |
| | F | 18 34 0 | ... | ... | ... | ... | |
| ,, 23rd | P | 8 28 58 | ... | ... | ... | 16900 | Great shock. Epc :— Pacific Ocean off Northern Chile, 19° 30′ S., 71° W. (J. S. A.) |
| | Sc Pc | 8 39 30 | ... | ... | ... | ... | |
| | PcS M | 9 30 22 | 18 | 16 | ... | ... | |
| | F | 11 17 0 | ... | ... | ... | ... | |
| ,, 23rd | P | 8 28 58 | ... | ... | ... | 16900 | Do. |
| | Sc Pc | 8 39 30 | ... | ... | ... | ... | |
| | PcS M | 9 30 1 | 21 | ... | 68 | ... | |
| | F | 11 30 0 | ... | ... | ... | ... | |
| ,, 25th | e | 4 27 0 | ... | ... | ... | ... | Tremors. |
| | f | 4 38 0 | ... | ... | ... | ... | |
| ,, 25th | e | 4 27 0 | ... | ... | ... | ... | Do. |
| | f | 4 38 0 | ... | ... | ... | ... | |
| ,, 27th | e | 16 34 0 | ... | ... | ... | ... | Do. |
| | f | 17 21 0 | ... | ... | ... | ... | |
| ,, 27th | e | 16 34 0 | ... | ... | ... | ... | Do. |
| | f | 17 21 0 | ... | ... | ... | ... | |
| Mar. 1st | e | 16 25 0 | ... | ... | ... | ... | Do. |
| | f | 16 40 0 | ... | ... | ... | ... | |
| ,, 1st | e | 16 26 0 | ... | ... | ... | ... | Do. |
| | f | 16 50 0 | ... | ... | ... | ... | |
| ,, 2nd | P | 17 41 35 | ... | ... | ... | 7250 | Very great. Epc :— Japan, near 39° 12′ N., 144° 36′ E. (C.M.O. Japan). |
| | S | 17 50 25 | ... | ... | ... | ... | |
| | L | 18 5 29 | ... | ... | ... | ... | |
| | M | 18 16 9 | 16 | 611 | ... | ... | |
| | F | 23 27 0 | ... | ... | ... | ... | |
| ,, 2nd | P | 17 41 35 | ... | ... | ... | 7250 | Do. |
| | S | 17 50 25 | ... | ... | ... | ... | |
| | L | 18 5 29 | ... | ... | ... | ... | |
| | M | 18 18 9 | 16 | ... | 477 | ... | |
| | F | 23 33 0 | ... | ... | ... | ... | |
| ,, 3rd | e | 2 28 0 | ... | ... | ... | ... | Tremors. |
| | f | 3 0 0 | ... | ... | ... | ... | |
| ,, 3rd | e | 2 28 0 | ... | ... | ... | ... | Do. |
| | f | 3 5 0 | ... | ... | ... | ... | |
| 1933. | | H. M. S. | | | | | |
| Mar. 3rd | P | 4 48 24 | ... | ... | ... | 7220 | Slight. Epi-centre in Japan. |
| | S | 4 57 3 | ... | ... | ... | ... | |
| | M | 5 19 29 | 12 | 2 | ... | ... | After shocks of the great shock of Mar. 2nd. 17 h. 42 m. (G.M.T.) |
| | F | 5 31 0 | ... | ... | ... | ... | |
| ,, 3rd | P | 4 48 24 | ... | ... | ... | 7220 | Do. |
| | S | 4 57 3 | ... | ... | ... | ... | |
| | M | 5 20 41 | 13 | ... | 1 | ... | |
| | F | 5 30 0 | ... | ... | ... | ... | |
| ,, 3rd | P | 9 23 19 | ... | ... | ... | 7220 | Do |
| | S | 9 31 59 | ... | ... | ... | ... | |
| | L | 9 46 44 | ... | ... | ... | ... | |
| | M | 9 54 7 | 15 | 4 | ... | ... | |
| | F | 11 14 0 | ... | ... | ... | ... | |
| ,, 3rd | P | 9 23 19 | ... | ... | ... | 7220 | Do. |
| | S | 9 31 59 | ... | ... | ... | ... | |
| | L | 9 46 44 | ... | ... | ... | ... | |
| | M | 9 52 29 | 17 | ... | 5 | ... | |
| | F | 11 21 0 | ... | ... | ... | ... | |
| ,, 3rd | e | 15 42 0 | ... | ... | ... | ... | Tremors. |
| | f | 16 4 0 | ... | ... | ... | ... | |
| ,, 3rd | e | 15 39 0 | ... | ... | ... | ... | Do. |
| | f | 16 5 0 | ... | ... | ... | ... | |
| ,, 3rd | e | 16 53 0 | ... | ... | ... | ... | Do. |
| | f | 16 57 0 | ... | ... | ... | ... | |
| ,, 3rd | e | 16 52 0 | ... | ... | ... | ... | Do. |
| | f | 16 57 0 | ... | ... | ... | ... | |
| ,, 3rd | e | 19 46 0 | ... | ... | ... | ... | Do. |
| | f | 19 54 0 | ... | ... | ... | ... | |
| ,, 3rd | e | 19 46 0 | ... | ... | ... | ... | Do. |
| | f | 19 54 0 | ... | ... | ... | ... | |
| ,, 5th | e | 8 30 0 | ... | ... | ... | ... | Do. |
| | f | 9 20 0 | ... | ... | ... | ... | |
| ,, 5th | e | 8 30 0 | ... | ... | ... | ... | Do. |
| | f | 9 26 0 | ... | ... | ... | ... | |

TABLE D 2—*contd.*

| Date. | Phase. | Time G. M. T. | Period (Sec.). | Amplitude (μ) $A_N$ | Amplitude (μ) $A_E$ | Distance (Km.) | Remarks. |
|---|---|---|---|---|---|---|---|
| 1933. | | H. M. S. | | | | | |
| | $A_N$ | | | | | | |
| Mar. 6th | P | 13 9 42 | ... | ... | ... | 1850 | Slight. Epc. :—Garo hills (West Assam). Felt at Dhubri, Gauhati, Cherrapunji, Rangpur Cooch Behar and Mymensingh. |
| | S | 13 12 54 | ... | ... | ... | ... | |
| | L | 13 14 34 | ... | ... | ... | ... | |
| | M | 13 15 6 | 6 | 26 | ... | ... | |
| | F | 14 18 0 | ... | ... | ... | ... | |
| | $A_E$ | | | | | | |
| ,, 6th | P | 13 9 42 | ... | ... | ... | 1850 | Do. |
| | S | 13 12 54 | ... | ... | ... | ... | |
| | L | 13 14 34 | ... | ... | ... | ... | |
| | M | 13 15 19 | 8 | ... | 19 | ... | |
| | F | 14 17 0 | ... | ... | ... | ... | |
| | $A_N$ | | | | | | |
| ,, 11th | e | 2 15 0 | ... | ... | ... | ... | Very feeble movements, phases not clear. Shock reported to be destructive in California (U.S.A.) |
| | f | 3 40 0 | ... | ... | ... | ... | |
| | $A_E$ | | | | | | |
| ,, 11th | e | 2 18 0 | ... | ... | ... | ... | Do. |
| | f | 3 40 0 | ... | ... | ... | ... | |
| | $A_N$ | | | | | | |
| ,, 11th | e | 14 32 49 | ... | ... | ... | ... | Slight. |
| | i | 14 41 50 | ... | ... | ... | ... | |
| | M | 15 5 5 | 15 | 5 | ... | ... | |
| | F | 15 58 0 | ... | ... | ... | ... | |
| | $A_E$ | | | | | | |
| ,, 11th | e | 14 32 49 | ... | ... | ... | ... | Do. |
| | i | 14 41 50 | ... | ... | ... | ... | |
| | M | 15 4 50 | 15 | ... | 4 | ... | |
| | F | 16 1 0 | ... | ... | ... | ... | |
| | $A_N$ | | | | | | |
| ,, 11th | P | 19 42 15 | ... | ... | ... | ... | Slight. L-waves poorly developed. |
| | i | 19 50 1 | ... | ... | ... | ... | |
| | PS (?) | 19 51 27 | ... | ... | ... | ... | |
| | M | 20 4 25 | 10 | 3 | ... | ... | |
| | F | 20 52 0 | ... | ... | ... | ... | |
| | $A_E$ | | | | | | |
| ,, 11th | P | 19 42 15 | ... | ... | ... | ... | Do. |
| | i | 19 50 1 | ... | ... | ... | ... | |
| | PS (?) | 19 51 27 | ... | ... | ... | ... | |
| | M | 20 4 30 | 11 | ... | 2 | ... | |
| | F | 20 53 0 | ... | ... | ... | ... | |
| | $A_N$ | | | | | | |
| ,, 15th | e | 5 28 0 | ... | ... | ... | ... | Tremors. |
| | f | 6 50 0 | ... | ... | ... | ... | |
| | $A_E$ | | | | | | |
| ,, 15th | e | 5 17 0 | ... | ... | ... | ... | Do. |
| | f | 6 55 0 | ... | ... | ... | ... | |

| Date. | Phase. | Time G. M. T. | Period (Sec.). | Amplitude (μ) $A_N$ | Amplitude (μ) $A_E$ | Distance (Km.) | Remarks. |
|---|---|---|---|---|---|---|---|
| 1933. | | H. M. S. | | | | | |
| | $A_N$ | | | | | | |
| Mar. 17th | P | 16 7 0 | ... | ... | ... | 8040 | Moderate. Epc. :—Kamchatka, 56° N., 160° E. (J.S.A.) |
| | S | 16 16 27 | ... | ... | ... | ... | |
| | L | 16 33 18 | ... | ... | ... | ... | |
| | M | 16 37 35 | 14 | 18 | ... | ... | |
| | F | 17 40 0 | ... | ... | ... | ... | |
| | $A_E$ | | | | | | |
| ,, 17th | P | 16 7 0 | ... | ... | ... | 8040 | Do. |
| | S | 16 16 27 | ... | ... | ... | ... | |
| | L | 16 33 18 | ... | ... | ... | ... | |
| | M | 16 43 1 | 18 | ... | 40 | ... | |
| | F | 18 42 0 | ... | ... | ... | ... | |
| | $A_N$ | | | | | | |
| ,, 17th | P | 19 41 51 | ... | ... | ... | 6320 | Moderate. Epc. :—Near Mindanao Island, 6° 30' N., 128° E. Manilla △ = 1200 Kms. |
| | S | 19 49 50 | ... | ... | ... | ... | |
| | L | 20 0 48 | ... | ... | ... | ... | |
| | M | 20 15 34 | 15 | 9 | ... | ... | |
| | F | 21 25 0 | ... | ... | ... | ... | |
| | $A_E$ | | | | | | |
| ,, 17th | P | 19 41 51 | ... | ... | ... | 6320 | Do. |
| | S | 19 49 50 | ... | ... | ... | ... | |
| | L | 20 0 48 | ... | ... | ... | ... | |
| | M | 20 10 59 | 17 | ... | 19 | ... | |
| | F | 21 22 0 | ... | ... | ... | ... | |
| | $A_N$ | | | | | | |
| ,, 18th | e | 3 24 0 | ... | ... | ... | ... | Tremors. |
| | f | 5 3 0 | ... | ... | ... | ... | |
| | $A_E$ | | | | | | |
| ,, 18th | e | 3 22 0 | ... | ... | ... | ... | Do. |
| | f | 5 1 0 | ... | ... | ... | ... | |
| | $A_N$ | | | | | | |
| ,, 18th | e | 18 30 0 | ... | ... | ... | ... | Do. |
| | f | 19 38 0 | ... | ... | ... | ... | |
| | $A_E$ | | | | | | |
| ,, 18th | e | 18 30 0 | ... | ... | ... | ... | Do. |
| | f | 19 38 0 | ... | ... | ... | ... | |
| | $A_E$ | | | | | | |
| ,, 18th-19th. | e | 23 58 0 | ... | ... | ... | ... | Do. |
| | f | 0 15 0 | ... | ... | ... | ... | |
| | $A_E$ | | | | | | |
| ,, 18th-19th. | e | 23 58 0 | ... | ... | ... | ... | Do. |
| | f | 0 15 0 | ... | ... | ... | ... | |
| | $A_N$ | | | | | | |
| ,, 22nd | P | 2 28 10 | ... | ... | ... | 2760 | Slight. |
| | S | 2 32 36 | ... | ... | ... | ... | |
| | F | 2 58 0 | ... | ... | ... | ... | |
| | $A_E$ | | | | | | |
| ,, 22nd | P | 2 28 10 | ... | ... | ... | 2760 | Do. |
| | S | 2 32 36 | ... | ... | ... | ... | |
| | F | 2 52 0 | ... | ... | ... | ... | |

| Date. | Phase. | Time G. M. T. | Period (Sec.). | Amplitude (μ) $A_N$ | Amplitude (μ) $A_E$ | Distance (Km.) | Remarks. |
|---|---|---|---|---|---|---|---|
| 1933. | | H. M. S. | | | | | |
| | $A_N$ | | | | | | |
| Mar. 23rd | P | 17 46 32 | ... | ... | ... | 4060 | Slight Epc. :—Gobi Desert (China). |
| | S | 17 52 23 | ... | ... | ... | ... | |
| | L | 17 57 58 | ... | ... | ... | ... | |
| | M | 18 2 34 | 10 | 8 | ... | ... | |
| | F | 18 38 0 | ... | ... | ... | ... | |
| | $A_E$ | | | | | | |
| ,, 23rd | P | 17 46 32 | ... | ... | ... | 4060 | Do. |
| | S | 17 52 23 | ... | ... | ... | ... | |
| | L | 17 57 58 | ... | ... | ... | ... | |
| | M | 18 0 6 | 11 | ... | 7 | ... | |
| | F | 18 39 0 | ... | ... | ... | ... | |
| | $A_N$ | | | | | | |
| ,, 30th | e | 20 46 0 | ... | ... | ... | ... | Tremors. |
| | f | 21 7 0 | ... | ... | ... | ... | |
| | $A_E$ | | | | | | |
| ,, 30th | e | 20 45 0 | ... | ... | ... | ... | Do. |
| | f | 21 4 0 | ... | ... | ... | ... | |
| | $A_N$ | | | | | | |
| ,, 31st | P | 22 5 24 | ... | ... | ... | 3040 | Slight Epc. :—China, near 24°N., 102° E. |
| | S | 22 10 10 | ... | ... | ... | ... | |
| | L | 22 14 42 | ... | ... | ... | ... | |
| | M | 22 15 17 | 13 | 4 | ... | ... | |
| | F | 22 34 0 | ... | ... | ... | ... | |
| | $A_E$ | | | | | | |
| ,, 31st | P | 22 5 24 | ... | ... | ... | 3050 | Do. |
| | S | 22 10 10 | ... | ... | ... | ... | |
| | L | 22 14 42 | ... | ... | ... | ... | |
| | M | 22 15 29 | 11 | ... | 2 | ... | |
| | F | 22 37 0 | ... | ... | ... | ... | |
| | $A_N$ | | | | | | |
| Apl. 1st | e | 16 18 0 | ... | ... | ... | ... | Tremors. |
| | f | 17 21 0 | ... | ... | ... | ... | |
| | $A_E$ | | | | | | |
| ,, 1st | e | 16 18 0 | ... | ... | ... | ... | Do. |
| | f | 17 20 0 | ... | ... | ... | ... | |
| | $A_N$ | | | | | | |
| ,, 2nd | e | 21 12 0 | ... | ... | ... | ... | Do. |
| | f | 21 29 0 | ... | ... | ... | ... | |
| | $A_E$ | | | | | | |
| ,, 2nd | e | 21 12 0 | ... | ... | ... | ... | Do. |
| | f | 21 30 0 | ... | ... | ... | ... | |
| | $A_N$ | | | | | | |
| ,, 3rd | e | 18 50 0 | ... | ... | ... | ... | Do. |
| | f | 19 6 0 | ... | ... | ... | ... | |
| | $A_E$ | | | | | | |
| ,, 3rd | e | 18 50 0 | ... | ... | ... | ... | Do. |
| | f | 19 6 0 | ... | ... | ... | ... | |

TABLE D 2—*contd.*

| Date. | Phase. | Time C. M. T. | Period (Sec.). | Amplitude (μ) $A_N$ | Amplitude (μ) $A_E$ | Distance (Km.) | Remarks. |
|---|---|---|---|---|---|---|---|
| 1933. | | H. M. S. | | | | | |
| | $A_N$ | | | | | | |
| Apl. 9th | P | 2 57 11 | ... | ... | ... | 6980 | Slight. Epc :— Japan, near 39° 30′ N., 143°E. (J. S. A.). |
| | S | 3 5 47 | ... | ... | ... | ... | |
| | L | 3 21 0 | ... | ... | ... | ... | |
| | M | 3 27 10 | 12 | 14 | ... | ... | |
| | F | 4 44 0 | ... | ... | ... | ... | |
| | $A_E$ | | | | | | |
| ,, 9th | P | 2 57 11 | ... | ... | ... | 6980 | Do. |
| | S | 3 5 47 | ... | ... | ... | ... | |
| | L | 3 19 8 | ... | ... | ... | ... | |
| | M | 3 28 0 | 13 | ... | 11 | ... | |
| | F | 4 56 0 | ... | ... | ... | ... | |
| | $A_N$ | | | | | | |
| ,, 9th | e | 4 59 0 | ... | ... | ... | ... | Tremors. |
| | f | 5 45 0 | ... | ... | ... | ... | |
| | $A_E$ | | | | | | |
| ,, 9th | e | 5 0 0 | ... | ... | ... | ... | Do. |
| | f | 5 45 0 | ... | ... | ... | ... | |
| | $A_N$ | | | | | | |
| ,, 13th | e | 22 23 0 | ... | ... | ... | ... | Do. |
| | f | 25 31 0 | ... | ... | ... | ... | |
| | $A_E$ | | | | | | |
| ,, 13th | e | 22 25 0 | ... | ... | ... | ... | Do. |
| | f | 23 16 0 | ... | ... | ... | ... | |
| | $A_N$ | | | | | | |
| ,, 16th | e | 6 46 0 | ... | ... | ... | ... | Do. |
| | f | 7 38 0 | ... | ... | ... | ... | |
| | $A_N$ | | | | | | |
| ,, 16th | e | 19 27 0 | ... | ... | ... | ... | Do. |
| | f | 20 4 0 | ... | ... | ... | ... | |
| | $A_E$ | | | | | | |
| ,, 16th | e | 19 27 0 | ... | ... | ... | ... | Do. |
| | f | 20 50 0 | ... | ... | ... | ... | |
| | $A_E$ | | | | | | |
| ,, 19th | P | 6 53 1 | ... | ... | ... | 5010 | Moderate. Epc. :— Formosa Island. |
| | S | 6 59 46 | ... | ... | ... | ... | |
| | L | 7 8 31 | ... | ... | ... | ... | |
| | M | 7 16 1 | 11 | ... | 12 | ... | |
| | F | 8 20 0 | ... | ... | ... | ... | |
| | $A_N$ | | | | | | |
| ,, 23rd | P | 6 5 38 | ... | ... | ... | 5060 | Slight. Epc. :— Kos Island in Aegean Sea, 36·5° N., 26·5° E. (Strasbourg). |
| | S | 6 12 36 | ... | ... | ... | ... | |
| | L | 6 22 5 | ... | ... | ... | ... | |
| | M | 6 30 41 | 12 | 8 | ... | ... | |
| | F | Mixed up in the following shock. | | | | | |

| Date. | Phase. | Time G. M. T. | Period (Sec.) | Amplitude (μ) $A_N$ | Amplitude (μ) $A_E$ | Distance (Km.) | Remarks. |
|---|---|---|---|---|---|---|---|
| 1933 | | H. M. S. | | | | | |
| | $A_E$ | | | | | | |
| Apl. 23rd | P | 6 5 38 | ... | ... | ... | 5060 | Slight. Epc :— Kos Islands in Agean Sea, 36°5 N., 26°5 E. (Strasbourg.) |
| | S | 6 12 36 | ... | ... | ... | ... | |
| | L | 6 22 5 | ... | ... | ... | ... | |
| | M | 6 26 37 | 16 | ... | 13 | ... | |
| | F | Mixed up in the following shock. | | | | | |
| | $A_N$ | | | | | | |
| ,, 23rd | P | 7 24 12 | ... | ... | ... | 6980 | Slight. Epc. :— Japan, near that of April 9. |
| | S | 7 32 48 | ... | ... | ... | ... | |
| | L | 7 47 39 | ... | ... | ... | ... | |
| | M | 7 54 21 | 13 | 6 | ... | ... | |
| | F | 9 28 0 | ... | ... | ... | ... | |
| | $A_E$ | | | | | | |
| ,, 23rd | P | 7 24 12 | ... | ... | ... | 6980 | Do. |
| | S | 7 32 48 | ... | ... | ... | ... | |
| | L | 7 47 39 | ... | ... | ... | ... | |
| | M | 7 59 4 | 11 | ... | 3 | ... | |
| | F | 9 49 0 | ... | ... | ... | ... | |
| | $A_N$ | | | | | | |
| ,, 27th | P | 2 49 21 | ... | ... | ... | 10300 | Great. Epc. :— 61° N., 150°W. (U. S. C.G.S.) Destructive in Alaska. |
| | Scales | 2 59 55 | ... | ... | ... | ... | |
| | L | 3 22 17 | ... | ... | ... | ... | |
| | M | 3 35 47 | 14 | 78 | ... | ... | |
| | F | 6 15 0 | ... | ... | ... | ... | |
| | $A_E$ | | | | | | |
| ,, 27th | P | 2 49 21 | ... | ... | ... | 10300 | Do. |
| | Scales | 2 59 55 | ... | ... | ... | ... | |
| | L | 3 22 17 | ... | ... | ... | ... | |
| | M | 3 37 10 | 13 | ... | 37 | ... | |
| | F | 6 3 0 | ... | ... | ... | ... | |
| | $A_N$ | | | | | | |
| ,, 27th | e | 12 9 0 | ... | ... | ... | ... | Tremors. |
| | f | 13 40 0 | ... | ... | ... | ... | |
| | $A_E$ | | | | | | |
| ,, 27th | e | 12 9 0 | ... | ... | ... | ... | Do. |
| | f | 13 33 0 | ... | ... | ... | ... | |
| | $A_N$ | | | | | | |
| May 1st | e | 19 2 0 | ... | ... | ... | ... | Do. |
| | f | 21 59 0 | ... | ... | ... | ... | |
| | $A_E$ | | | | | | |
| ,, 1st | e | 19 2 0 | ... | ... | ... | ... | Do. |
| | f | 21 41 0 | ... | ... | ... | ... | |
| | $A_N$ | | | | | | |
| ,, 1-2nd | e | 23 27 0 | ... | ... | ... | ... | Do. |
| | f | 0 21 0 | ... | ... | ... | ... | |
| | $A_E$ | | | | | | |
| ,, 1-2nd | e | 23 32 0 | ... | ... | ... | ... | Do. |
| | f | 0 18 0 | ... | ... | ... | ... | |

| Date. | Phase. | Time G. M. T. | Period (Sec.) | Amplitude (μ) $A_N$ | Amplitude (μ) $A_E$ | Distance (Km.) | Remarks. |
|---|---|---|---|---|---|---|---|
| 1933. | | H. M. S. | | | | | |
| | $A_N$ | | | | | | |
| May 6th | e | 5 53 0 | ... | ... | ... | ... | Tremors. |
| | i | 7 52 0 | ... | ... | ... | ... | |
| | $A_E$ | | | | | | |
| ,, 6th | e | 5 53 0 | ... | ... | ... | ... | Do. |
| | f | 7 31 0 | ... | ... | ... | ... | |
| | $A_N$ | | | | | | |
| ,, 8th | i | 10 53 15 | ... | ... | ... | ... | Slight. Very distant. Beginning not traceable. |
| | M | 11 59 29 | 28 | 33 | ... | ... | |
| | F | 13 13 0 | ... | ... | ... | ... | |
| | $A_E$ | | | | | | |
| ,, 8th | i | 10 53 15 | ... | ... | ... | ... | Do. |
| | M | 12 4 3 | 28 | ... | 13 | ... | |
| | F | 12 51 0 | ... | ... | ... | ... | |
| | $A_N$ | | | | | | |
| ,, 11th | P | 18 18 24 | ... | ... | ... | 5140 | Slight. Epc. :— Gulf of Salonica, 40° N., 24° E. (Strasbourg). |
| | S | 18 25 16 | ... | ... | ... | ... | |
| | L | 18 34 43 | ... | ... | ... | ... | |
| | F | 20 32 0 | ... | ... | ... | ... | |
| | $A_E$ | | | | | | |
| ,, 11th | P | 18 18 24 | ... | ... | ... | 5140 | Do. |
| | S | 18 25 16 | ... | ... | ... | ... | |
| | L | 18 34 43 | ... | ... | ... | ... | |
| | F | 20 21 0 | ... | ... | ... | ... | |
| | $A_N$ | | | | | | |
| ,, 12th | P | 16 16 14 | ... | ... | ... | 2720 | Slight. Epc. :— Upper Yangtse Valley (China) 25° N., 100° E. |
| | S | 16 20 37 | ... | ... | ... | ... | |
| | L | 16 23 43 | ... | ... | ... | ... | |
| | F | 16 45 0 | ... | ... | ... | ... | |
| | $A_E$ | | | | | | |
| ,, 12th | P | 16 16 14 | ... | ... | ... | 2720 | Do. |
| | S | 16 20 37 | ... | ... | ... | ... | |
| | L | 16 23 43 | ... | ... | ... | ... | |
| | F | 16 49 0 | ... | ... | ... | ... | |
| | $A_N$ | | | | | | |
| ,, 16th | P | 1 18 9 | ... | ... | ... | 2900 | Moderate Epc :— North west Sumatra. |
| | S | 1 22 45 | ... | ... | ... | ... | |
| | L | 1 26 23 | ... | ... | ... | ... | |
| | M | 1 37 33 | 15 | 34 | ... | ... | |
| | F | 3 29 0 | ... | ... | ... | ... | |
| | $A_E$ | | | | | | |
| ,, 16th | P | 1 18 9 | ... | ... | ... | 2900 | Do. |
| | S | 1 22 45 | ... | ... | ... | ... | |
| | L | 1 26 23 | ... | ... | ... | ... | |
| | M | 1 37 43 | 17 | ... | 53 | ... | |
| | F | 3 17 0 | ... | ... | ... | ... | |
| | $A_N$ | | | | | | |
| ,, 18th | e | 0 30 0 | ... | ... | ... | ... | Tremors. |
| | f | 1 15 0 | ... | ... | ... | ... | |

TABLE D 2—*contd.*

| Date. | Phase. | Time G.M.T. | Period (Sec.) | Amplitude (μ) $A_N$ | Amplitude (μ) $A_E$ | Distance (Km.) | Remarks. |
|---|---|---|---|---|---|---|---|
| 1933. | | H. M. S. | | | | | |
| May 18th | $A_E$ e | 0 32 0 | ... | ... | ... | ... | Tremors. |
| | f | 1 9 0 | ... | ... | ... | ... | |
| ,, 18th | $A_N$ P | 10 29 30 | ... | ... | ... | 830 | Slight. |
| | S | 10 31 0 | ... | ... | ... | ... | |
| | M | 10 32 30 | 10 | 9 | ... | ... | |
| | F | 10 50 0 | ... | ... | ... | ... | |
| ,, 18th | $A_E$ P | 10 29 30 | ... | ... | ... | 830 | Do. |
| | S | 10 31 0 | ... | ... | ... | ... | |
| | M | 10 32 30 | 9 | ... | 6 | ... | |
| | F | 10 50 0 | ... | ... | ... | ... | |
| ,, 19th | $A_N$ e | 17 35 0 | ... | ... | ... | ... | Tremors. |
| | f | 17 47 0 | ... | ... | ... | ... | |
| ,, 19th | $A_E$ e | 17 35 0 | ... | ... | ... | ... | Do. |
| | f | 17 45 0 | ... | ... | ... | ... | |
| ,, 19th | $A_N$ P | 18 11 1 | ... | ... | ... | 9340 | Slight. Epc.:—Atlantic Ocean, 1·5° S., 11°W. (Strasbourg). |
| | S | 18 21 27 | ... | ... | ... | ... | |
| | L | 18 42 24 | ... | ... | ... | ... | |
| | M | 18 45 49 | 18 | 7 | ... | ... | |
| | F | 20 3 0 | ... | ... | ... | ... | |
| ,, 19th | $A_E$ P | 18 11 1 | ... | ... | ... | 9340 | Do. |
| | S | 18 21 27 | ... | ... | ... | ... | |
| | L | 18 42 24 | ... | ... | ... | .. | |
| | M | 18 51 11 | 18 | ... | 6 | ... | |
| | F | 20 50 0 | ... | ... | ... | ... | |
| ,, 20th | $A_N$ e | 5 36 0 | ... | ... | ... | ... | Tremors. |
| | f | 6 21 0 | ... | ... | ... | ... | |
| ,, 20th | $A_E$ e | 5 36 0 | ... | ... | ... | ... | Do. |
| | f | 6 21 0 | ... | ... | ... | ... | |
| June 2nd | $A_N$ P | 7 48 10 | ... | ... | ... | 6220 | Slight. Epc.:—Japan, near 31° 36′ N., 131° 6′ E. (Tai-hoku). |
| | S | 7 56 3 | ... | ... | ... | ... | |
| | L | 8 7 39 | ... | ... | ... | ... | |
| | M | 8 14 28 | 12 | 3 | ... | ... | |
| | F | 8 35 0 | ... | ... | ... | ... | |
| ,, 2nd | $A_E$ P | 7 48 10 | ... | ... | ... | 6220 | Do. |
| | S | 7 56 3 | ... | ... | ... | ... | |
| | L | 8 7 39 | ... | ... | ... | ... | |
| | M | 8 16 33 | 15 | ... | 5 | ... | |
| | F | 8 35 0 | ... | ... | ... | ... | |
| 1933. | | H. M. S. | | | | | |
| June 3rd | $A_N$ P | 17 18 20 | ... | ... | ... | 5810 | Slight. Epc.:—Luchu Island 28° 30′ N., 129° 30′ E. (Tai-hoku). |
| | S | 17 25 50 | ... | ... | ... | ... | |
| | L | 17 36 38 | ... | ... | ... | .. | |
| | M | 17 42 16 | 11 | 6 | ... | ... | |
| | F | 18 8 0 | ... | ... | ... | ... | |
| ,, 3rd | $A_E$ P | 17 18 20 | ... | ... | ... | 5810 | Do. |
| | S | 17 25 50 | ... | ... | ... | ... | |
| | L | 17 36 38 | ... | ... | ... | ... | |
| | M | 17 45 5 | 15 | ... | 4 | ... | |
| | F | 17 54 0 | ... | ... | ... | ... | |
| ,, 6th | $A_N$ P | 2 36 49 | ... | ... | ... | 4900 | Slight. Epc.:—Philippine Island, 14° 20′ N., 121° 36′ E. (Manilla). |
| | S | 2 43 28 | ... | ... | ... | ... | |
| | L | 2 52 16 | ... | ... | ... | .. | |
| | M | 2 57 38 | 15 | 5 | ... | ... | |
| | F | 3 41 0 | ... | ... | ... | ... | |
| ,, 6th | $A_E$ P | 2 36 49 | ... | ... | ... | 4900 | Do. |
| | S | 2 43 28 | ... | ... | ... | ... | |
| | L | 2 52 16 | ... | ... | ... | ... | |
| | M | 2 57 16 | 16 | ... | 4 | ... | |
| | F | 3 29 0 | ... | ... | ... | ... | |
| ,, 7th | $A_N$ P | 11 51 44 | ... | ... | ... | 2870 | Moderate. Epc.:—Yangtse Valley (China), 25° 12′ N., 101° 54′ E (Chiu feng) |
| | S | 11 56 18 | ... | ... | ... | ... | |
| | L | 12 0 16 | ... | ... | ... | ... | |
| | M | 12 3 34 | 8 | 21 | ... | ... | |
| | F | 12 49 0 | ... | ... | ... | ... | |
| ,, 7th | $A_E$ P | 11 51 44 | ... | ... | ... | 2870 | Do. |
| | S | 11 56 18 | ... | ... | ... | ... | |
| | L | 12 0 16 | ... | ... | ... | ... | |
| | M | 12 3 34 | 8 | ... | 17 | ... | |
| | F | 12 49 0 | ... | ... | ... | ... | |
| ,, 8th | $A_N$ P | 18 21 16 | ... | ... | ... | 7090 | Slight. Epc.:—Japan. near 40° 12′ N., 144° E. (Tai-hoku). |
| | S | 18 29 58 | ... | ... | ... | ... | |
| | L | 18 44 57 | ... | ... | ... | ... | |
| | M | 18 52 15 | 15 | 4 | ... | ... | |
| | F | 19 13 0 | ... | ... | ... | ... | |
| ,, 8th | $A_E$ P | 18 21 16 | ... | ... | ... | 7090 | Do. |
| | S | 18 29 58 | ... | ... | ... | ... | |
| | L | 18 44 57 | ... | ... | ... | ... | |
| | M | 18 51 31 | 15 | ... | 2 | ... | |
| | F | 19 12 0 | ... | ... | ... | ... | |
| 1933. | | H. M. S. | | | | | |
| June 10th | $A_N$ e | 12 48 0 | ... | ... | ... | ... | Tremors. |
| | f | 13 4 0 | ... | ... | ... | ... | |
| ,, 10th | $A_E$ e | 12 45 0 | ... | ... | ... | ... | Do. |
| | f | 13 4 0 | ... | ... | ... | ... | |
| ,, 12th | $A_N$ e | 18 43 0 | ... | ... | ... | ... | Do. |
| | f | 19 23 0 | ... | ... | ... | ... | |
| ,, 12th | $A_E$ e | 18 46 0 | ... | ... | ... | ... | Do. |
| | f | 19 15 0 | ... | ... | ... | ... | |
| ,, 13th | $A_N$ P | 20 44 8 | ... | ... | ... | 6870 | Slight. Epc.:—Japan off mouth of Mabuti River (Taihoku). |
| | S | 20 52 38 | ... | ... | ... | ... | |
| | L | 21 6 53 | ... | ... | ... | ... | |
| | M | 21 12 29 | 18 | 5 | ... | ... | |
| | F | 22 9 0 | ... | ... | ... | ... | |
| ,, 13th | $A_E$ P | 20 44 8 | ... | ... | ... | 6870 | Do. |
| | S | 20 53 38 | ... | ... | ... | ... | |
| | L | 21 6 53 | ... | ... | ... | ... | |
| | M | 21 13 17 | 17 | ... | 3 | ... | |
| | F | 21 38 0 | ... | ... | ... | ... | |
| ,, 13th | $A_N$ e | 23 7 0 | ... | ... | ... | ... | Tremors. |
| | f | 23 45 0 | ... | ... | ... | ... | |
| ,, 13th | $A_E$ e | 23 9 0 | ... | ... | ... | ... | Do. |
| | f | 23 35 0 | ... | ... | ... | ... | |
| ,, 18th-19th. | $A_N$ P | 21 47 58 | ... | ... | ... | 6750 | Great. Epc.:—Japan, 38°N., 142°E. (U.S.C.G.S.) 43°N. 142°E. (Strasbourg). |
| | S | 21 56 21 | ... | ... | ... | ... | |
| | L | 22 10 32 | ... | ... | ... | ... | |
| | M | 22 14 57 | 15 | 68 | ... | ... | |
| | F | 0 29 0 | ... | ... | ... | ... | |
| ,, 18th 19th. | $A_E$ P | 21 47 58 | ... | ... | ... | 6750 | Do. |
| | S | 21 56 21 | .. | ... | ... | ... | |
| | L | 22 10 32 | ... | ... | ... | ... | |
| | M | 22 16 2 | 16 | ... | 81 | ... | |
| | F | 0 47 0 | ... | ... | ... | ... | |
| ,, 24th-25th. | $A_N$ P | 22 2 24 | ... | ... | ... | 4440 | Very great. Destructive in Southern Sumatra. Epc.:—4°S., 103·5°E. (Strasbourg) |
| | S | 22 8 38 | ... | ... | .. | ... | |
| | L | 22 15 16 | ... | ... | ... | ... | |
| | M | 22 19 5 | 18 | 550 | ... | ... | |
| | F | 2 15 0 | ... | ... | ... | ... | |

TABLE D 2—*contd.*

| Date. | Phase. | Time G. M. T. | Period (Sec.). | Amplitude (μ) $A_N$ | Amplitude (μ) $A_E$ | Distance (K. m.) | Remarks. |
|---|---|---|---|---|---|---|---|
| 1933. | | H. M. S. | | | | | |
| June 24th-25th. | $A_E$ P | 22 2 24 | ... | ... | ... | 4440 | Very great. Destructive in Southern Sumatra. Epc. :—4°S., 103·5°E (Strasbourg.) |
| | S | 22 8 38 | ... | ... | ... | ... | |
| | L | 22 15 16 | ... | ... | ... | ... | |
| | M | 22 19 37 | 18 | ... | 357 | ... | |
| | F | Confused in microseisms. | | | | | |
| | $A_N$ | | | | | | |
| ,, 25th | e | 18 4 0 | ... | ... | ... | ... | Tremors. |
| | f | 18 40 0 | ... | ... | ... | ... | |
| | $A_E$ | | | | | | |
| ,, 25th | e | 18 11 0 | ... | ... | ... | ... | Do. |
| | f | 18 39 0 | ... | ... | ... | .. | |
| | $A_N$ | | | | | | |
| ,, 29th | e | 0 23 0 | ... | ... | ... | ... | Do. |
| | f | 0 55 0 | ... | ... | ... | ... | |
| | $A_E$ | | | | | | |
| ,, 29th | e | 0 23 0 | ... | ... | ... | ... | Do. |
| | f | 0 46 0 | ... | ... | ... | ... | |
| | $A_N$ | | | | | | |
| July 3rd | P | 15 18 10 | ... | ... | ... | 3100 | Slight. Epc. :—5°N., 80°W., west of Sumatra, Batavia △ = 1910 kms. |
| | S | 15 23 12 | ... | ... | ... | ... | |
| | L | 15 24 43 | ... | ... | ... | ... | |
| | M | 15 25 30 | 10 | 4 | ... | ... | |
| | F | Mixed up with microseisms. | | | | | |
| | $A_E$ | | | | | | |
| ,, 3rd | P | 15 18 10 | ... | ... | ... | 3100 | Do. |
| | S | 15 23 12 | ... | ... | ... | ... | |
| | L | 15 24 43 | ... | ... | ... | ... | |
| | M | 15 28 0 | 9 | ... | 3 | ... | |
| | F | Mixed up with microseisms. | | | | | |
| | $A_N$ | | | | | | |
| ,, 4th | e | 3 1 0 | ... | ... | ... | ... | Tremors. |
| | f | 3 20 0 | ... | ... | ... | ... | |
| | $A_E$ | | | | | | |
| ,, 4th | e | 3 5 0 | ... | ... | ... | ... | Do. |
| | f | 3 20 0 | ... | ... | ... | ... | |
| | $A_N$ | | | | | | |
| ,, 4th | e | 7 33 0 | ... | ... | ... | ... | Distant, feeble. |
| | M | 7 39 44 | 15 | 8 | ... | ... | |
| | F | Mixed up with microseisms. | | | | ... | |
| | $A_E$ | | | | | | |
| ,, 4th | e | 7 33 0 | ... | ... | ... | ... | Do. |
| | M | 7 39 14 | 13 | ... | 7 | ... | |
| | F | Mixed up with microseisms. | | | | | |
| | $A_N$ | | | | | | |
| ,, 8th | e | 8 36 0 | ... | ... | ... | ... | Tremors. |
| | f | 8 52 0 | ... | ... | ... | ... | |
| July 8th | $A_E$ e | 8 36 0 | ... | ... | ... | ... | Tremors. |
| | f | 8 51 0 | ... | ... | ... | ... | |
| ,, 9th | $A_N$ P | 1 41 0 | ... | ... | ... | 7780 | Slight. Epc. :—near Kurile Islands. |
| | S | 1 50 7 | ... | ... | ... | ... | |
| | L | 2 4 23 | ... | ... | ... | ... | |
| | M | 2 14 15 | 15 | 11 | ... | ... | |
| | F | 3 31 0 | ... | ... | ... | ... | |
| ,, 9th | $A_E$ P | 1 41 0 | ... | ... | ... | 7780 | Do. |
| | S | 1 50 7 | ... | ... | ... | ... | |
| | L | 2 4 23 | ... | ... | ... | ... | |
| | M | 2 16 45 | 15 | ... | 8 | ... | |
| | F | Mixed up with microseisms. | | | | | |
| ,, 9th | $A_N$ eP | 9 38 53 | ... | ... | ... | 7890 | Slight. |
| | S | 9 48 3 | ... | ... | ... | ... | |
| | L | 10 4 15 | ... | ... | ... | ... | |
| | M | 10 16 23 | 15 | 6 | ... | ... | |
| | F | 11 20 0 | ... | ... | ... | ... | |
| ,, 9th | $A_E$ eP | 9 38 53 | ... | ... | ... | 7890 | Do. |
| | S | 9 48 3 | ... | ... | ... | ... | |
| | L | 10 4 15 | ... | ... | ... | ... | |
| | M | Uncertain | | | | ... | |
| | F | Mixed up with microseisms. | | | | ... | |
| ,, 9th | $A_N$ P | 12 41 37 | ... | ... | ... | 7670 | Moderate. Epc. :—45°N., 150°E. near Kurile Islands. |
| | S | 12 50 45 | ... | ... | ... | ... | |
| | L | 13 7 2 | ... | ... | ... | ... | |
| | M | 13 14 49 | 15 | 26 | ... | ... | |
| | F | 15 24 0 | ... | ... | ... | ... | |
| ,, 9th | $A_E$ P | 12 41 37 | ... | ... | ... | 7670 | Do. |
| | S | 12 50 45 | ... | ... | ... | ... | |
| | L | 13 7 2 | ... | ... | ... | ... | |
| | M | 13 17 21 | 15 | ... | 20 | ... | |
| | F | Confused with microseisms. | | | | ... | |
| ,, 9th | $A_N$ e | 16 19 0 | ... | ... | ... | ... | Distant, very feeble. |
| | M | 16 52 0 | 13 | 3 | ... | ... | |
| | F | Confused with microseisms. | | | | | |
| ,, 9th | $A_E$ e | 16 19 0 | ... | ... | ... | ... | Do. |
| | M | 16 52 0 | 14 | ... | 3 | ... | |
| | F | Confused with microseisms. | | | | | |
| ,, 9th | $A_N$ e | 22 52 0 | ... | ... | ... | ... | Tremors. |
| | f | 23 12 0 | ... | ... | ... | ... | |
| July 9th | $A_E$ e | 22 54 0 | ... | ... | ... | ... | Tremos. |
| | f | 23 9 0 | ... | ... | ... | ... | |
| ,, 10th | $A_N$ e | 0 32 0 | ... | ... | ... | ... | Distant, feeble. |
| | M | 1 1 37 | 15 | 3 | ... | ... | |
| | F | Confused with microseisms. | | | | ... | |
| ,, 10th | $A_E$ e | 0 32 11 | ... | ... | ... | ... | Do. |
| | M | Movements very small. | | | | ... | |
| | F | Confused with microseisms. | | | | ... | |
| ,, 10th | $A_N$ e | 3 45 0 | ... | ... | ... | ... | Very distan, feeble. |
| | M | 4 52 30 | 19 | 8 | ... | ... | |
| | F | 5 34 0 | ... | ... | ... | ... | |
| ,, 10th | $A_E$ e | 3 45 0 | ... | ... | ... | ... | Do. |
| | M | 4 55 15 | 18 | ... | 3 | ... | |
| | F | Confused with microseisms. | | | | | |
| ,, 10th | $A_N$ e | 10 44 0 | ... | ... | ... | ... | Tremors. |
| | f | 11 33 0 | ... | ... | ... | ... | |
| ,, 10th | $A_E$ e | 10 44 0 | ... | ... | ... | ... | Do. |
| | f | 11 32 0 | ... | ... | ... | ... | |
| ,, 13th | $A_N$ e | 8 28 0 | ... | ... | ... | ... | Do. |
| | f | 8 55 0 | ... | ... | ... | ... | |
| ,, 13th | $A_E$ e | 8 27 0 | ... | ... | ... | ... | Do. |
| | f | 8 57 0 | ... | ... | ... | ... | |
| ,, 13th | $A_N$ e | 14 31 0 | ... | ... | ... | ... | Do. |
| | f | 15 17 0 | ... | ... | ... | ... | |
| ,, 13th | $A_E$ e | 14 31 0 | ... | ... | ... | ... | Do. |
| | f | 15 9 0 | ... | ... | ... | ... | |
| ,, 13th | $A_N$ eP | 23 16 58 | ... | ... | ... | 1940 | Feeble. Epc. :—North Assam, felt at Gauhati |
| | S | 23 18 38 | ... | ... | ... | ... | |
| | F | 23 26 0 | ... | ... | ... | ... | |
| ,, 13th | $A_E$ eP | 23 16 58 | ... | ... | ... | 1940 | Do. |
| | F | 23 18 38 | ... | ... | ... | .. | |
| | F | 23 28 0 | ... | ... | ... | ... | |

TABLE D 2—*contd.*

| Date. | Phase. | Time G. M. T. | Period (Sec.) | Amplitude (μ) $A_N$ | Amplitude (μ) $A_E$ | Distance (Km.) | Remarks. |
|---|---|---|---|---|---|---|---|
| 1933. | | H. M. S. | | | | | |
| July 16th-17th. | $A_N$ P | 23 48 2 | ... | ... | ... | ... | Slight, felt locally Origin probably within 100 kms. of Bombay. |
| | F | 0 0 0 | ... | ... | ... | ... | |
| | $A_E$ P | 23 48 2 | ... | ... | ... | ... | |
| ,, 16th-17th. | F | 0 0 0 | ... | ... | ... | ... | Do. |
| ,, 18th | $A_N$ e | 19 24 0 | ... | ... | ... | ... | Tremors. |
| | f | 20 6 0 | ... | ... | ... | ... | |
| ,, 18th | $A_E$ e | 19 24 0 | ... | ... | ... | ... | Do. |
| | f | 20 0 0 | ... | ... | ... | ... | |
| ,, 19th | $A_N$ e | 11 9 0 | ... | ... | ... | ... | Do. |
| | f | 12 17 0 | ... | ... | ... | ... | |
| ,, 19th | $A_E$ e | 11 9 0 | ... | ... | ... | ... | Do. |
| | f | 12 11 0 | ... | ... | ... | ... | |
| ,, 19th | $A_N$ e | 14 17 0 | ... | ... | ... | ... | Do. |
| | f | 14 51 0 | ... | ... | ... | ... | |
| ,, 19th | $A_E$ e | 14 17 0 | ... | ... | ... | ... | Do. |
| | f | 14 51 0 | ... | ... | ... | ... | |
| 19th | $A_N$ e | 15 45 0 | ... | ... | ... | ... | Do. |
| | f | 16 24 0 | ... | ... | ... | ... | |
| ,, 19th | $A_E$ e | 15 45 0 | ... | ... | ... | ... | Do. |
| | F | 16 21 0 | ... | ... | ... | ... | |
| ,, 19th | $A_N$ e | 20 54 0 | ... | ... | ... | ... | Do. |
| | f | 21 20 0 | ... | ... | ... | ... | |
| ,, 19th | $A_E$ e | 20 54 0 | ... | ... | ... | ... | Do. |
| | f | 21 20 0 | ... | ... | ... | ... | |
| ,, 20th | $A_N$ e | 22 33 0 | ... | ... | ... | ... | Do. |
| | f | 23 3 0 | ... | ... | ... | ... | |
| ,, 20th | $A_E$ e | 22 33 0 | ... | ... | ... | ... | Do. |
| | f | 23 3 0 | ... | ... | ... | ... | |
| ,, 21st | $A_N$ e | 20 25 28 | ... | ... | ... | 12200 | Slight. Epc :— Near Sandwich Islands. |
| | PS | 20 35 28 | ... | ... | ... | ... | |
| | $SR_1$ | 20 41 48 | ... | ... | ... | ... | |
| | L | 21 0 0 | ... | ... | ... | ... | |
| | M | 21 5 6 | 19 | 11 | ... | ... | |
| | F | 21 52 0 | ... | ... | ... | ... | |
| July 21st | $A_E$ e | 20 25 28 | ... | ... | ... | 12200 | Slight Epc :— Near Sandwich Islands. |
| | PS | 20 35 28 | ... | ... | ... | ... | |
| | $SR_1$ | 20 41 48 | ... | ... | ... | ... | |
| | L | 21 0 0 | ... | ... | ... | ... | |
| | M | 21 4 45 | 19 | ... | 8 | ... | |
| | F | 22 43 0 | ... | ... | ... | ... | |
| ,, 22nd-23rd. | $A_N$ P | 21 8 18 | ... | ... | ... | 10300 | Moderate, Epc :— Near Fox Islands. |
| | PS | 21 20 25 | ... | ... | ... | ... | |
| | $SR_1$ | 21 25 41 | ... | ... | ... | ... | |
| | L | 21 40 11 | ... | ... | ... | ... | |
| | M | 21 52 6 | 17 | 37 | ... | ... | |
| | F | 23 7 0 | ... | ... | ... | ... | |
| ,, 22nd-23rd. | $A_E$ P | 21 8 18 | ... | ... | ... | 10300 | Do. |
| | $PR_1$ | 21 11 56 | ... | ... | ... | ... | |
| | Sc PcS | 21 18 50 | ... | ... | ... | ... | |
| | $SR_1$ | 21 25 48 | ... | ... | ... | ... | |
| | eL | 21 40 0 | ... | ... | ... | ... | |
| | M | 21 53 36 | 19 | ... | 51 | ... | |
| | F | 0 11 0 | ... | ... | ... | ... | |
| ,, 24th | $A_N$ e | 19 21 16 | ... | ... | ... | ... | Very distant, slight; confused with microseisms. |
| | e | 19 32 27 | ... | ... | ... | ... | |
| | M | 20 12 34 | 19 | 4 | ... | ... | |
| | F | 20 18 0 | ... | ... | ... | ... | |
| ,, 24th | $A_E$ e | 19 21 16 | ... | ... | ... | ... | Do. |
| | e | 19 32 27 | ... | ... | ... | ... | |
| | L | 19 44 12 | ... | ... | ... | ... | |
| | M | 20 10 20 | 19 | ... | 3 | ... | |
| | F | 21 18 0 | ... | ... | ... | ... | |
| ,, 30th | $A_N$ e | 17 40 0 | ... | ... | ... | ... | Tremors. |
| | f | 18 3 0 | ... | ... | ... | ... | |
| ,, 30th | $A_E$ e | 17 39 0 | ... | ... | ... | ... | Do. |
| | f | 17 54 0 | ... | ... | ... | ... | |
| Aug. 4th | $A_N$ e | 17 42 25 | ... | ... | ... | ... | Very feeble shock. |
| | F | 18 2 0 | ... | ... | ... | ... | |
| ,, 5th | $A_N$ e | 2 7 0 | ... | ... | ... | ... | Tremors. |
| | f | 2 12 0 | ... | ... | ... | ... | |
| ,, 11th | $A_N$ P | 8 59 25 | ... | ... | ... | 2850 | Omori-Ewing data. |
| | eS | 9 3 57 | ... | ... | ... | ... | Moderate. |
| | eL | 9 6 27 | ... | ... | ... | ... | Epc :— 28°N., 97°E., near Namkin Mountains. |
| | F | 9 30 0 | ... | ... | ... | ... | |
| Aug. 11th | $A_N$ e | 11 22 50 | ... | ... | ... | ... | Feeble. |
| | F | 11 42 0 | ... | ... | ... | ... | |
| ,, 13th | $A_N$ eP | 17 2 18 | ... | ... | ... | ... | Do. |
| | M | 17 6 32 | 7 | 1 | ... | ... | |
| | F | 17 22 0 | ... | ... | ... | ... | |
| ,, 13th | $A_N$ P | 9 37 28 | ... | ... | ... | 5960 | Slight. |
| | S | 9 45 6 | ... | ... | ... | ... | |
| | L | 9 52 59 | ... | ... | ... | ... | |
| | M | 9 58 16 | 19 | 16 | ... | ... | |
| | F | 11 32 0 | ... | ... | ... | ... | |
| ,, 13th | $A_E$ P | 9 37 28 | ... | ... | ... | 5960 | Do. |
| | S | 9 45 6 | ... | ... | ... | ... | |
| | L | 9 52 37 | ... | ... | ... | ... | |
| | M | 9 56 50 | 19 | ... | 7 | ... | |
| | F | 10 16 0 | ... | ... | ... | ... | |
| ,, 14th | $A_N$ e | 18 13 0 | ... | ... | ... | ... | Tremors, |
| | f | 18 32 0 | ... | ... | ... | ... | |
| ,, 14th | $A_E$ e | 18 13 0 | ... | ... | ... | ... | |
| | f | 18 30 0 | ... | ... | ... | ... | |
| ,, 14th | $A_N$ e | 22 27 0 | ... | ... | ... | ... | Feeble. |
| | M | 22 35 10 | 11 | 3 | ... | ... | |
| | F | 22 48 0 | ... | ... | ... | ... | |
| ,, 14th | $A_E$ e | 22 27 0 | ... | ... | ... | ... | Do. |
| | M | 22 35 10 | ... | ... | ... | ... | |
| | F | 22 48 0 | ... | ... | ... | ... | |
| ,, 15th | $A_N$ e | 3 8 29 | ... | ... | ... | ... | Feeble, distant. |
| | e | 3 17 10 | ... | ... | ... | ... | |
| | F | 3 55 0 | ... | ... | ... | ... | |
| ,, 15th | $A_E$ e | 3 8 29 | ... | ... | ... | ... | Do. |
| | e | 3 17 10 | ... | ... | ... | ... | |
| | F | 3 49 0 | ... | ... | ... | ... | |
| ,, 20th | $A_N$ i | 11 54 8 | ... | ... | ... | ... | Slight, distant. |
| | i | 12 1 16 | ... | ... | ... | ... | |
| | M | 12 17 54 | 14 | 9 | ... | ... | |
| | F | 13 33 0 | ... | ... | ... | ... | |
| ,, 20th | $A_E$ i | 11 54 8 | ... | ... | ... | ... | Do. |
| | i | 12 1 16 | ... | ... | ... | ... | |
| | M | 12 17 38 | 15 | ... | 10 | ... | |
| | F | 13 25 0 | ... | ... | ... | .. | |

TABLE D 2—*contd.*

| Date. | Phase. | Time G. M. T. | Period (Sec.) | Amplitude (μ) $A_N$ | Amplitude (μ) $A_E$ | Distance (Km.) | Remarks |
|---|---|---|---|---|---|---|---|
| 1933. | | H. M. S. | | | | | |
| Aug. 22nd | $A_N$ e | 11 11 4 | ... | ... | ... | ... | Feeble, distant. |
| | M | 11 40 15 | 19 | 3 | ... | ... | |
| | F | 12 34 0 | ... | ... | ... | ... | |
| ,, 22nd | $A_N$ e | 13 29 16 | ... | ... | ... | ... | Very feeble. |
| | M | 13 45 23 | ... | ... | ... | ... | |
| | F | 14 16 0 | ... | ... | ... | ... | |
| ,, 22nd | $A_N$ i | 21 41 17 | ... | ... | ... | ... | Do. |
| | i | 21 48 30 | ... | ... | ... | ... | |
| | F | 22 35 0 | ... | ... | ... | ... | |
| ,, 24th | $A_N$ e | 22 53 0 | ... | ... | ... | ... | Tremors. |
| | f | 23 23 0 | ... | ... | ... | ... | |
| ,, 25th | $A_N$ e | 4 37 0 | ... | ... | ... | ... | Do. |
| | f | 5 16 0 | ... | ... | ... | ... | |
| ,, 25th | $A_N$ e | 5 44 0 | ... | ... | ... | ... | Do. |
| | f | 6 23 0 | ... | ... | ... | ... | |
| ,, 25th | $A_N$ P | 7 56 45 | ... | ... | ... | 3340 | Great. Destructive in China. Epc :— 32°N., 103·5°E. |
| | $PR_1$ | 7 57 33 | ... | ... | ... | ... | |
| | S | 8 1 51 | ... | ... | ... | ... | |
| | $SR_1$ | 8 3 23 | ... | ... | ... | ... | |
| | L | 8 5 37 | ... | ... | ... | ... | |
| | M | 8 7 33 | 18 | 857 | ... | ... | |
| | F | Mixed up with after shock. | | | | | |
| ,, 26th | $A_N$ e | 11 55 0 | ... | ... | ... | ... | Tremors. |
| | f | 12 14 0 | ... | ... | ... | ... | |
| ,, 26th | $A_N$ e | 13 16 0 | ... | ... | ... | ... | Do. |
| | f | 13 23 0 | ... | ... | ... | ... | |
| ,, 28th-29th. | $A_N$ eP | 22 34 26 | ... | ... | ... | 12400 | Great. Epc :— Near Sandwich Islands, 58°S., 27°W. (J.S.A.) |
| | $PR_1$ | 22 38 54 | ... | ... | ... | ... | |
| | Sc PcS | 22 45 0 | ... | ... | ... | ... | |
| | PS | 22 48 26 | ... | ... | ... | ... | |
| | PPS | 22 49 25 | ... | ... | ... | ... | |
| | $SR_1$ | 22 54 25 | ... | ... | ... | ... | |
| | L | 23 12 20 | ... | ... | ... | ... | |
| | M | 23 41 17 | 17 | 61 | ... | ... | |
| | F | 2 59 0 | ... | ... | ... | ... | |
| ,, 29th | $A_N$ e | 15 10 23 | ... | ... | ... | ... | Slight. |
| | e | 15 20 11 | ... | ... | ... | ... | |
| | F | 16 27 0 | ... | ... | ... | ... | |

| Date. | Phase. | Time G. M. T. | Period (Sec.) | Amplitude (μ) $A_N$ | Amplitude (μ) $A_E$ | Distance (Km.) | Remarks. |
|---|---|---|---|---|---|---|---|
| 1933. | | H. M. S. | | | | | |
| Sep. 2nd | $A_N$ i | 16 50 45 | ... | ... | ... | ... | L-waves poorly developed. |
| | i | 16 58 27 | ... | ... | ... | ... | |
| | M | Movements small. | | | | | |
| | F | 18 44 0 | ... | ... | ... | ... | |
| ,, 2nd | $A_E$ i | 16 50 45 | ... | ... | ... | ... | |
| | i | 16 58 27 | ... | ... | ... | ... | Do. |
| | M | Movements small. | | | | | |
| | F | 18 3 0 | ... | ... | ... | ... | |
| ,, 6th | $A_N$ e | 1 40 0 | ... | ... | ... | ... | Tremors. |
| | f | 2 33 0 | ... | ... | ... | ... | |
| | $A_E$ e | 1 49 0 | ... | ... | ... | ... | Do. |
| | f | 2 18 0 | ... | ... | ... | ... | |
| ,, 6th | $A_N$ e | 10 33 0 | ... | ... | ... | ... | Do. |
| | f | 10 58 0 | ... | ... | ... | ... | |
| | $A_E$ e | 10 37 0 | ... | ... | ... | ... | Do. |
| | f | 10 55 0 | ... | ... | ... | ... | |
| ,, 6th | $A_N$ e | 17 37 28 | ... | ... | ... | ... | Slight. |
| | M | 17 59 20 | 15 | 4 | ... | ... | |
| | F | 18 11 0 | ... | ... | ... | ... | |
| | $A_E$ e | 17 37 28 | ... | ... | ... | ... | Do. |
| | M | Movements too small. | | | | | |
| | F | 18 52 0 | ... | ... | ... | ... | |
| ,, 6-7th | $A_N$ P | 22 22 27 | ... | ... | ... | 13300 | Slight. |
| | S | 22 35 57 | ... | ... | ... | ... | L-waves poorly developed. Epc :— Pacific Ocean, 24°S., 178°W. (J. S. A.) |
| | M | 23 20 27 | 17 | 3 | ... | ... | |
| | F | 0 49 0 | ... | ... | ... | ... | |
| ,, 6-7th | $A_E$ P | 22 22 27 | ... | ... | ... | ... | |
| | S | 22 35 57 | ... | ... | ... | 13300 | Do. |
| | M | Uncertain. | | | | | |
| | F | 0 28 0 | ... | ... | ... | ... | |
| ,, 7th | $A_N$ e | 18 8 0 | ... | ... | ... | ... | Tremors. |
| | f | 18 32 0 | ... | ... | ... | ... | |
| ,, 7-8th | $A_N$ e | 23 14 0 | ... | ... | ... | ... | Feeble. |
| | M | 23 23 56 | 17 | 5 | ... | ... | |
| | F | 0 2 0 | ... | ... | ... | ... | |
| ,, 9th | $A_N$ e | 1 58 0 | ... | ... | ... | ... | Tremors. |
| | f | 2 4 0 | ... | ... | ... | ... | |
| ,, 9th | $A_N$ e | 4 23 0 | ... | ... | ... | ... | Do. |
| | f | 5 48 0 | ... | ... | ... | ... | |

| Date. | Phase. | Time G. M. T. | Period (Sec.) | Amplitude (μ) $A_N$ | Amplitude (μ) $A_E$ | Distance (Km.) | Remarks |
|---|---|---|---|---|---|---|---|
| 1933. | | H. M. S. | | | | | |
| Sept. 13th | $A_N$ e | 13 16 0 | ... | ... | ... | ... | Tremors. |
| | f | 14 32 0 | ... | ... | ... | ... | |
| ,, 14th | $A_N$ e | 22 53 0 | ... | ... | ... | ... | Do. |
| | f | 23 18 0 | ... | ... | ... | ... | |
| ,, 15th | $A_N$ e | 16 34 0 | ... | ... | ... | ... | Do. |
| | f | 17 9 0 | ... | ... | ... | ... | |
| ,, 15th | $A_N$ e | 20 6 0 | ... | ... | ... | ... | Do. |
| | f | 20 38 0 | ... | ... | ... | ... | |
| ,, 20th | $A_N$ e | 0 31 0 | ... | ... | ... | ... | Do. |
| | f | 0 53 0 | ... | ... | ... | ... | |
| ,, 20-21st | $A_N$ e | 23 42 3 | ... | ... | ... | ... | Slight. |
| | i | 23 48 48 | ... | ... | ... | ... | |
| | M | 0 5 13 | 14 | 3 | ... | ... | |
| | F | 0 40 0 | ... | ... | ... | ... | |
| ,, 20-21st | $A_E$ i | 23 42 3 | ... | ... | ... | ... | Do. |
| | i | 23 48 48 | ... | ... | ... | ... | |
| | M | 0 5 33 | 14 | ... | 3 | ... | |
| | F | 0 49 0 | ... | ... | ... | ... | |
| ,, 21st | $A_N$ e | 3 24 22 | ... | ... | ... | ... | Very feeble, distant. |
| | M | 3 53 22 | 13 | 2 | ... | ... | |
| | F | 4 24 0 | ... | ... | ... | ... | |
| ,, 21st | $A_E$ e | 3 24 42 | ... | ... | ... | ... | Do. |
| | M | 3 51 39 | 13 | ... | 3 | ... | |
| | F | 4 25 0 | ... | ... | ... | ... | |
| ,, 21st | $A_N$ e | 4 26 0 | ... | ... | ... | ... | Tremors. |
| | f | 4 52 0 | ... | ... | ... | ... | |
| ,, 21st | $A_E$ e | 4 26 0 | ... | ... | ... | ... | Do. |
| | f | 4 58 0 | ... | ... | ... | ... | |
| ,, 21st | $A_N$ P | 9 58 32 | ... | ... | ... | 7290 | Slight Epc :— Near Japan. |
| | eS | 10 7 22 | ... | ... | ... | ... | |
| ,, 21st | L | 10 22 18 | ... | ... | ... | ... | |
| | M | 10 29 28 | 13 | 5 | ... | ... | |
| | F | 11 30 0 | ... | ... | ... | ... | |
| ,, 21st | $A_E$ P | 9 58 32 | ... | ... | ... | 7290 | Do. |
| | S | 10 7 22 | ... | ... | ... | ... | |
| | L | 10 22 18 | ... | ... | ... | ... | |
| | M | 10 27 58 | 13 | ... | 3 | ... | |
| | F | 11 38 0 | ... | ... | ... | ... | |

TABLE D 2—*contd.*

| Date. | Phase. | Time G. M. T. | Period (Sec.). | Amplitude (μ) $A_N$ | Amplitude (μ) $A_E$ | Distance (Km.) | Remarks. |
|---|---|---|---|---|---|---|---|
| 1933. | | H. M. S. | | | | | |
| Sep. 21st | $A_N$ e | 14 16 0 | ... | ... | ... | ... | Tremors. |
| | f | 14 33 0 | ... | ... | ... | ... | |
| ,, 21st | $A_E$ e | 14 17 0 | ... | ... | ... | ... | Do. |
| | f | 14 33 0 | ... | ... | ... | ... | |
| ,, 21st | $A_N$ e | 19 18 0 | ... | ... | ... | ... | Do. |
| | f | 19 38 0 | ... | ... | ... | ... | |
| ,, 21st | $A_E$ e | 19 19 0 | ... | ... | ... | ... | Do. |
| | f | 19 37 0 | ... | ... | ... | ... | |
| ,, 24th | $A_N$ P | 15 32 21 | ... | ... | ... | 10000 | Slight. Epc.:—Near Aleutian Islands, 51° N., 177° W, (U. S. C. G. S.). |
| | S | 15 43 13 | ... | ... | ... | ... | |
| | eL | 16 4 0 | ... | ... | ... | ... | |
| | M | 16 14 18 | 20 | 14 | ... | ... | |
| | F | 18 14 0 | ... | ... | ... | ... | |
| ,, 24th | $A_E$ P | 15 32 21 | ... | ... | ... | 10000 | Do. |
| | S | 15 42 43 | ... | ... | ... | ... | |
| | eL | 16 4 0 | ... | ... | ... | ... | |
| | M | 16 11 58 | 20 | ... | 10 | ... | |
| | F | 18 25 0 | ... | ... | ... | ... | |
| ,, 25th | $A_N$ eP | 13 55 7 | ... | ... | ... | 5960 | Slight. |
| | eS | 14 2 41 | ... | ... | ... | ... | |
| | eL | 14 14 26 | ... | ... | ... | ... | |
| | F | 14 39 0 | ... | ... | ... | ... | |
| ,, 25th | $A_E$ eP | 13 55 7 | ... | ... | ... | 5960 | Do. |
| | eS | 14 2 41 | ... | ... | ... | ... | |
| | eL | 14 14 26 | ... | ... | ... | ... | |
| | F | 14 42 0 | ... | ... | ... | ... | |
| ,, 25th | $A_N$ P | 18 56 29 | ... | ... | ... | 2590 | Moderate. Epc.:—Near Kokoshili range in China, 37° N., 87° E. |
| | S | 19 0 40 | ... | ... | ... | ... | |
| | $SR_1$ | 19 1 40 | ... | ... | ... | ... | |
| | L | 19 2 55 | ... | ... | ... | ... | |
| | M | 19 14 18 | 9 | 30 | ... | ... | |
| | F | 21 12 0 | ... | ... | ... | ... | |
| ,, 25th | $A_E$ P | 18 56 29 | ... | ... | ... | 2590 | Do. |
| | S | 19 0 40 | ... | ... | ... | ... | |
| | $SR_1$ | 19 1 35 | ... | ... | ... | ... | |
| | L | 19 2 52 | ... | ... | ... | ... | |
| | M | 19 4 26 | 10 | ... | 22 | ... | |
| | F | 21 9 0 | ... | ... | ... | ... | |
| 1933. | | H. M. S. | | | | | |
| Sep. 27th | $A_N$ e | 21 53 36 | ... | ... | ... | ... | Very feeble. |
| | F | 22 56 0 | ... | ... | ... | ... | |
| ,, 27th | $A_E$ e | 21 53 36 | ... | ... | ... | ... | Do. |
| | F | 22 47 0 | ... | ... | ... | ... | |
| ,, 30th | $A_N$ i | 14 32 0 | ... | ... | ... | ... | Feeble, distant. |
| | M | 15 0 45 | 23 | 7 | ... | ... | |
| | F | 17 18 0 | ... | ... | ... | ... | |
| ,, 30th | $A_E$ i | 14 32 0 | ... | ... | ... | ... | Do. |
| | M | 15 2 41 | 20 | ... | 5 | ... | |
| | F | 17 21 0 | ... | ... | ... | ... | |
| Oct. 1st | $A_N$ e | 2 59 0 | ... | ... | ... | ... | Tremors. |
| | f | 3 9 0 | ... | ... | ... | ... | |
| ,, 1st | $A_E$ e | 2 57 0 | ... | ... | ... | ... | Do. |
| | f | 3 9 0 | ... | ... | ... | ... | |
| ,, 2nd | $A_N$ e | 14 21 0 | ... | ... | ... | ... | Do. |
| | f | 15 25 0 | ... | ... | ... | ... | |
| ,, 2nd | $A_E$ e | 14 23 0 | ... | ... | ... | ... | Do. |
| | f | 15 35 0 | ... | ... | ... | ... | |
| ,, 3rd | $A_N$ $P^1$ | 15 49 15 | ... | ... | ... | 17200 | Moderate. Epc.:—Pacific Ocean, West of Central America, 2·5° S., 80° W. (J. S. A.) |
| | $PR_1$ | 15 52 48 | ... | ... | ... | ... | |
| | $SR_1$ | 16 12 0 | ... | ... | ... | ... | |
| | M | 17 4 7 | 17 | 14 | ... | ... | |
| | F | 18 53 0 | ... | ... | ... | ... | |
| ,, 3rd | $A_E$ $P^1$ | 15 49 15 | ... | ... | ... | 17200 | Do. |
| | $PR_1$ | 15 52 48 | ... | ... | ... | ... | |
| | $SR_1$ | 16 12 0 | ... | ... | ... | ... | |
| | M | 17 3 26 | 17 | ... | 23 | ... | |
| | F | 19 6 0 | ... | ... | ... | ... | |
| ,, 3rd | $A_N$ e | 10 34 0 | ... | ... | ... | ... | Tremors. |
| | f | 11 15 0 | ... | ... | ... | ... | |
| ,, 3rd | $A_N$ e | 10 32 0 | ... | ... | ... | ... | Do. |
| | f | 11 12 0 | ... | ... | ... | ... | |
| ,, 3rd | $A_N$ e | 11 42 0 | ... | ... | ... | ... | Do. |
| | f | 13 0 0 | ... | ... | ... | ... | |
| ,, 3rd | $A_E$ e | 11 41 0 | ... | ... | ... | ... | Do. |
| | f | 13 0 0 | ... | ... | ... | ... | |
| 1933. | | H. M. S. | | | | | |
| Oct. 3rd | $A_N$ eP | 18 48 55 | ... | ... | ... | 6780 | Slight. |
| | S | 18 57 10 | ... | ... | ... | ... | |
| | eL | 19 10 0 | ... | ... | ... | ... | |
| | M | 19 16 40 | 15 | 3 | ... | ... | |
| | F | 19 48 0 | ... | ... | ... | ... | |
| ,, 3rd | $A_E$ P | 18 48 55 | ... | ... | ... | 6780 | Do. |
| | S | 18 57 10 | ... | ... | ... | ... | |
| | eL | 19 10 0 | ... | ... | ... | ... | |
| | M | 19 17 14 | 15 | ... | 3 | ... | |
| | F | 19 49 0 | | | | | |
| ,, 4th | $A_N$ e | 16 33 0 | ... | ... | ... | ... | Tremors. |
| | f | 17 12 0 | ... | ... | ... | ... | |
| ,, 4th | $A_E$ e | 16 33 0 | ... | ... | ... | ... | Do. |
| | f | 17 12 0 | ... | ... | ... | ... | |
| ,, 5th | $A_N$ e | 12 20 0 | ... | ... | ... | ... | Do. |
| | f | 12 53 0 | ... | ... | ... | ... | |
| ,, 5th | $A_E$ e | 12 20 0 | ... | ... | ... | ... | Do. |
| | f | 12 50 0 | ... | ... | ... | ... | |
| ,, 5th | $A_N$ P | 13 34 29 | ... | ... | ... | 2370 | Moderate. Epc.:—Northern Persia, 35° N., 57° E. |
| | S | 13 38 24 | ... | ... | ... | ... | |
| | $SR_1$ | 13 39 22 | ... | ... | ... | ... | |
| | M | 13 44 33 | 13 | 36 | ... | ... | |
| | F | 15 22 0 | ... | ... | ... | ... | |
| ,, 5th | $A_E$ P | 13 34 29 | ... | ... | ... | 2370 | Do. |
| | S | 13 38 24 | ... | ... | ... | ... | |
| | SR1 | 13 39 21 | ... | ... | ... | ... | |
| | L | 13 40 25 | ... | ... | ... | ... | |
| | M | 13 42 36 | 17 | ... | 70 | ... | |
| | F | 15 18 0 | ... | ... | ... | ... | |
| ,, 5th | $A_N$ e | 16 35 0 | ... | ... | ... | ... | Tremors. |
| | f | 17 0 0 | ... | ... | ... | ... | |
| ,, 5th | $A_E$ e | 16 35 0 | ... | ... | ... | ... | Do. |
| | f | 17 1 0 | ... | ... | ... | ... | |
| ,, 7th | $A_E$ e | 2 55 0 | ... | ... | ... | ... | Do. |
| | f | 3 6 0 | ... | ... | ... | ... | |
| ,, 7th | $A_E$ e | 2 56 0 | ... | ... | ... | ... | Do. |
| | f | 3 8 0 | ... | ... | ... | ... | |

TABLE D 2—*contd.*

| Date. | Phase. | Time. G. M. T. | Period (Sec.). | Amplitude (μ) $A_N$ | Amplitude (μ) $A_E$ | Distance (Km.) | Remarks. |
|---|---|---|---|---|---|---|---|
| 1933. | | H. M. S. | | | | | |
| Oct. 9th | $A_N$ e | 9 55 0 | ... | ... | ... | ... | Tremors. |
| | f | 10 1 0 | ... | ... | ... | ... | |
| ,, 9th | $A_E$ e | 9 55 0 | ... | ... | ... | ... | Do. |
| | f | 10 1 0 | ... | ... | ... | ... | |
| ,, 10th | $A_N$ e | 12 36 0 | ... | ... | ... | ... | Do |
| | f | 13 17 0 | ... | ... | ... | ... | |
| ,, 11th | $A_N$ e | 1 19 0 | ... | ... | ... | ... | Do. |
| | f | 1 43 0 | ... | ... | ... | ... | |
| ,, 11th | $A_E$ e | 1 21 0 | ... | ... | ... | ... | Do. |
| | f | 1 43 0 | ... | ... | ... | ... | |
| ,, 13th | $A_N$ e | 11 49 0 | ... | ... | ... | ... | Do. |
| | f | 11 56 0 | ... | ... | ... | ... | |
| ,, 13th | $A_E$ e | 11 50 0 | ... | ... | ... | ... | Do. |
| | f | 11 58 0 | ... | ... | ... | ... | |
| ,, 14th | $A_N$ e | 22 32 19 | ... | ... | ... | ... | Feeble, distant. |
| | M | 23 18 49 | 19 | 5 | ... | ... | |
| | F | 23 52 0 | ... | ... | ... | ... | |
| ,, 14th | $A_E$ e | 22 32 19 | ... | ... | ... | ... | Do. |
| | M | 23 19 30 | 19 | ... | 5 | ... | |
| | F | 23 49 0 | ... | ... | ... | ... | |
| ,, 16th | $A_N$ e | 3 37 0 | ... | ... | ... | ... | Tremors. |
| | f | 3 51 0 | ... | ... | ... | ... | |
| ,, 16th | $A_E$ e | 3 37 0 | ... | ... | ... | ... | Do. |
| | f | 3 53 0 | ... | ... | ... | ... | |
| ,, 16th | $A_N$ P | 4 38 18 | ... | ... | ... | 3220 | Slight. |
| | S | 4 43 19 | ... | ... | ... | ... | |
| | L | 4 46 30 | ... | ... | ... | ... | |
| | M | 4 47 12 | 7 | 8 | ... | ... | |
| | F | 5 15 0 | ... | ... | ... | ... | |
| ,, 16th | $A_E$ eP | 4 38 18 | ... | ... | ... | 3220 | Do. |
| | S | 4 43 19 | ... | ... | ... | ... | |
| | L | 4 46 15 | ... | ... | ... | ... | |
| | M | 4 48 14 | 9 | ... | 5 | ... | |
| | F | 5 19 0 | ... | ... | ... | ... | |
| ,, 16th | $A_N$ e | 11 20 0 | ... | ... | ... | ... | Tremors. |
| | f | 11 36 0 | ... | ... | ... | ... | |
| Oct. 16th | $A_E$ e | 11 21 0 | ... | ... | ... | ... | Tremors. |
| | f | 11 35 0 | ... | ... | ... | ... | |
| ,, 17th | $A_N$ e | 12 36 0 | ... | ... | ... | ... | Do. |
| | f | 13 5 0 | ... | ... | ... | ... | |
| ,, 17th | $A_E$ e | 12 36 0 | ... | ... | ... | ... | Do. |
| | f | 13 12 0 | ... | ... | ... | ... | |
| ,, 19th | $A_N$ e | 5 31 11 | ... | ... | ... | ... | Very feeble, masked by micro-seisms |
| | F | 5 49 0 | ... | ... | ... | ... | |
| ,, 19th | $A_E$ e | 5 31 11 | ... | ... | ... | ... | Do. |
| | F | 5 50 0 | ... | ... | ... | ... | |
| ,, 19th | $A_N$ e | 6 5 0 | ... | ... | ... | ... | Tremors. |
| | f | 6 11 0 | ... | ... | ... | ... | |
| ,, 19th | $A_E$ e | 6 5 0 | ... | ... | ... | ... | Do. |
| | f | 6 11 0 | ... | ... | ... | ... | |
| ,, 21st | $A_N$ P | 2 54 52 | . | ... | ... | 6890 | Slight. |
| | S | 3 3 15 | ... | ... | ... | ... | |
| | M | 3 24 15 | 14 | 3 | ... | ... | |
| | F | 4 0 0 | ... | ... | ... | ... | |
| ,, 21st | $A_E$ P | 2 54 52 | ... | ... | ... | 6890 | Do. |
| | S | 3 3 15 | ... | ... | ... | ... | |
| | M | 3 26 41 | 15 | ... | 1 | ... | |
| | F | 3 56 0 | ... | ... | ... | ... | |
| ,, 21st | $A_N$ e | 7 59 0 | ... | ... | ... | ... | Tremors. |
| | f | 8 14 0 | ... | ... | ... | ... | |
| ,, 21st | $A_E$ e | 7 59 0 | ... | ... | ... | ... | Do. |
| | f | 8 14 0 | ... | ... | ... | ... | |
| ,, 21st | $A_N$ e | 8 25 0 | ... | ... | ... | ... | Do. |
| | f | 8 43 0 | ... | ... | ... | ... | |
| ,, 21st | $A_N$ e | 8 27 0 | ... | ... | ... | ... | Do. |
| | f | 8 38 0 | ... | ... | ... | ... | |
| ,, 22nd | $A_N$ e | 0 45 0 | ... | ... | ... | ... | Do. |
| | f | 1 36 0 | ... | ... | ... | ... | |
| ,, 22nd | $A_E$ e | 0 45 0 | ... | ... | ... | ... | Do. |
| | f | 1 33 0 | ... | ... | ... | ... | |
| Oct. 22nd | $A_N$ e | 12 14 6 | ... | ... | ... | ... | Slight, very distant. |
| | M | 12 35 41 | 15 | 3 | ... | ... | |
| | F | 13 11 0 | ... | ... | ... | ... | |
| ,, 22nd | $A_E$ e | 12 14 6 | ... | ... | ... | ... | Do. |
| | M | 12 39 29 | 14 | ... | 3 | ... | |
| | F | 13 11 0 | ... | ... | ... | ... | |
| ,, 22nd | $A_N$ e | 14 6 6 | ... | ... | ... | ... | Feeble, distant. |
| | M | 14 15 48 | 9 | 3 | ... | ... | |
| | F | 14 30 0 | ... | ... | ... | ... | |
| ,, 22nd | $A_E$ e | 14 6 6 | ... | ... | ... | ... | Do. |
| | L | 14 12 45 | ... | ... | ... | ... | |
| | M | 14 45 10 | 9 | ... | 2 | ... | |
| | F | 14 29 0 | ... | ... | ... | ... | |
| ,, 23rd | $A_N$ e | 4 59 0 | ... | ... | ... | ... | Tremors. |
| | f | 5 31 0 | ... | ... | ... | ... | |
| ,, 23rd | $A_E$ e | 5 0 0 | ... | ... | ... | ... | Do. |
| | f | 5 27 0 | ... | ... | ... | ... | |
| ,, 23rd | $A_N$ e | 12 59 0 | ... | ... | ... | ... | Do. |
| | f | 13 17 0 | ... | ... | ... | ... | |
| ,, 23rd | $A_E$ e | 12 59 0 | ... | ... | ... | ... | Do. |
| | f | 13 20 0 | ... | ... | ... | ... | |
| ,, 23rd | $A_N$ e | 13 42 20 | ... | ... | ... | ... | Feeble, distant. |
| | i | 13 50 4 | ... | ... | ... | ... | |
| | M | 14 6 8 | 11 | 3 | ... | ... | |
| | F | 14 59 0 | ... | ... | ... | ... | |
| ,, 23rd | $A_E$ e | 13 42 20 | ... | ... | ... | ... | Do. |
| | i | 13 50 4 | ... | ... | ... | ... | |
| | M | 14 3 42 | 11 | ... | 3 | ... | |
| | F | 15 4 0 | ... | ... | ... | ... | |
| ,, 23rd | $A_N$ e | 22 32 0 | ... | ... | ... | ... | Tremors. |
| | f | 22 47 0 | ... | ... | ... | ... | |
| ,, 23rd | $A_E$ e | 22 32 0 | ... | ... | ... | ... | Do. |
| | f | 22 46 0 | ... | ... | ... | ... | |
| ,, 24th | $A_N$ e | 5 33 19 | ... | ... | ... | ... | Very feeble. |
| | e | 5 37 93 | ... | ... | ... | ... | |
| | M | 5 45 7 | 7 | 1 | ... | ... | |
| | F | 6 0 0 | ... | ... | ... | ... | |

TABLE D 2—*contd.*

| Date. | Phase. | Time G. M. T. | Period (Sec.) | AMPLITUDE (μ). A_N | A_E | Distance (Km.) △ | Remarks. |
|---|---|---|---|---|---|---|---|
| 1933. | | H. M. S. | | | | | |
| Oct. 24th | $A_E$ i | 5 33 19 | ... | ... | ... | ... | Very feeble. |
| | i | 5 37 33 | ... | ... | ... | ... | |
| | F | 5 59 0 | ... | ... | ... | ... | |
| ,, 24th | $A_N$ e | 10 42 0 | ... | ... | ... | ... | Tremors. |
| | f | 10 45 0 | ... | ... | ... | ... | |
| ,, 24th | $A_E$ e | 10 42 0 | ... | ... | ... | ... | Do. |
| | f | 10 45 0 | ... | ... | ... | ... | |
| ,, 25th 26th | $A_N$ e | 23 47 17 | ... | ... | ... | 16000 | Slight Epc: — South America. 22°S, 68° W. (J. S. A.) |
| | M | 0 42 7 | 19 | 4 | ... | ... | |
| | F | 1 52 0 | ... | ... | ... | ... | |
| ,, 25th 26th | $A_E$ $P^1$ | 23 47 17 | ... | ... | ... | 16000 | Do. |
| | Sc P cP | 23 51 30 | ... | ... | ... | ... | |
| | P Sc PcS | 0 0 34 | ... | ... | ... | ... | |
| | M | 0 39 5 | 20 | ... | 7 | ... | |
| | F | 2 4 0 | ... | ... | ... | ... | |
| ,, 25th 26th | $A_N$ eP | 7 3 23 | ... | ... | ... | 2170 | Feeble. |
| | S | 7 7 0 | ... | ... | ... | ... | |
| | F | 7 26 0 | ... | ... | ... | ... | |
| ,, 25th 26th | $A_E$ eP | 7 3 23 | ... | ... | ... | 2170 | Do. |
| | S | 7 7 0 | ... | ... | ... | ... | |
| | F | 7 31 0 | ... | ... | ... | ... | |
| ,, 26th | $A_N$ e | 8 43 0 | ... | ... | ... | ... | Tremors. |
| | f | 8 59 0 | ... | ... | ... | ... | |
| ,, 26th | $A_E$ e | 8 47 0 | ... | ... | ... | ... | Do. |
| | f | 9 3 0 | ... | ... | ... | ... | |
| ,, 26th | $A_N$ e | 12 28 0 | ... | ... | ... | ... | Feeble. |
| | M | 13 34 0 | 17 | 5 | ... | ... | |
| | F | 14 56 0 | ... | ... | ... | ... | |
| ,, 26th | $A_E$ e | 12 28 0 | ... | ... | ... | ... | Do. |
| | M | 13 34 0 | 17 | ... | 4 | ... | |
| | F | 14 57 0 | ... | ... | ... | ... | |
| ,, 26th | $A_N$ eP | 20 53 36 | ... | ... | ... | ... | Do. |
| | M | 20 58 59 | 7 | 1 | ... | ... | |
| | F | 21 4 0 | ... | ... | ... | ... | |
| ,, 26th | $A_E$ eP | 20 53 36 | ... | ... | ... | ... | Do. |
| | F | 21 7 0 | ... | ... | ... | ... | |
| ,, 30th | $A_N$ e | 7 21 0 | ... | ... | ... | ... | Tremors |
| | f | 8 38 0 | ... | ... | ... | ... | |
| 1933. | | H. M. S. | | | | | |
| Oct. 30th | $A_E$ e | 7 17 21 | ... | ... | ... | ... | Tremors. |
| | F | 8 53 0 | ... | ... | ... | ... | |
| ,, 30th | $A_N$ e | 11 43 0 | ... | ... | ... | ... | Do. |
| | f | 11 55 0 | ... | ... | ... | ... | |
| ,, 30th | $A_E$ e | 11 43 0 | ... | ... | ... | ... | Do. |
| | f | 11 51 0 | ... | ... | ... | ... | |
| Nov. 2nd | $A_N$ P | 12 39 47 | ... | ... | ... | 11000 | Slight. Epc:— North Pacific Ocean, 45°N., 168°W. (J.S.A.) |
| | S(?) | 12 51 21 | ... | ... | ... | ... | |
| | eL | 13 13 0 | ... | ... | ... | ... | |
| | M | 13 21 43 | 21 | 8 | ... | ... | |
| | F | 15 17 0 | ... | ... | ... | ... | |
| ,, 2nd | $A_E$ P | 12 39 47 | ... | ... | ... | 11000 | Do. |
| | S(?) | 12 51 21 | ... | ... | ... | ... | |
| | eL | 13 11 54 | ... | ... | ... | ... | |
| | M | 13 21 43 | 21 | ... | 9 | ... | |
| | F | 15 26 0 | ... | ... | ... | ... | |
| ,, 2nd | $A_N$ e | 13 7 30 | ... | ... | ... | ... | Very feeble. |
| | e | 13 11 26 | ... | ... | ... | ... | |
| | M | 13 17 26 | 13 | 2 | ... | ... | |
| | F | 13 35 0 | ... | ... | ... | ... | |
| ,, 3rd | $A_E$ e | 13 7 30 | ... | ... | ... | ... | Do. |
| | e | 13 11 26 | ... | ... | ... | ... | |
| | L | 13 14 4 | ... | ... | ... | ... | |
| | M | 13 16 42 | 11 | ... | 2 | ... | |
| | F | 13 36 0 | ... | ... | ... | ... | |
| ,, 5th | A P | 20 32 34 | ... | ... | ... | 2880 | Slight. Epc:— North-east frontier of Burma, 25°N., 98°E. Nanking △ = 2870 kms. |
| | S | 20 37 3 | ... | ... | ... | ... | |
| | L | 20 40 21 | ... | ... | ... | ... | |
| | F | 21 21 0 | ... | ... | ... | ... | |
| ,, 5th | $A_E$ P | 20 32 34 | ... | ... | ... | 2880 | Do. |
| | S | 20 37 3 | ... | ... | ... | ... | |
| | L | 20 40 21 | ... | ... | ... | ... | |
| | F | 21 21 0 | ... | ... | ... | ... | |
| ,, 6th | $A_N$ e | 7 19 0 | ... | ... | ... | ... | Tremors. |
| | f | 7 43 0 | ... | ... | ... | ... | |
| ,, 6th | $A_E$ e | 7 19 0 | ... | ... | ... | ... | Do. |
| | f | 7 50 0 | ... | ... | ... | ... | |
| ,, 7th | $A_N$ e | 6 51 0 | ... | ... | ... | ... | Do. |
| | f | 7 11 0 | ... | ... | ... | ... | |
| 1933. | | H. M. S. | | | | | |
| Nov. 7th | $A_E$ e | 6 53 0 | ... | ... | ... | ... | Tremors. |
| | f | 7 10 0 | ... | ... | ... | ... | |
| ,, 7th | $A_N$ P | 11 14 45 | ... | ... | ... | 2320 | Slight. Epc:— Near Arakan Coast, 20°N., 93°E. Nanking △ = 2974 kms. Calcutta △ = 560 kms. |
| | S | 11 18 33 | ... | ... | ... | ... | |
| | L | 11 20 33 | ... | ... | ... | ... | |
| | M | 11 22 31 | 7 | 4 | ... | ... | |
| | F | 11 40 0 | ... | ... | ... | ... | |
| ,, 7th | $A_E$ P | 11 14 45 | ... | ... | ... | 2320 | Do. |
| | S | 11 18 33 | ... | ... | ... | ... | |
| | L | 11 20 33 | ... | ... | ... | ... | |
| | M | 11 22 31 | 8 | ... | 3 | ... | |
| | F | 11 38 0 | ... | ... | ... | ... | |
| ,, 8th | $A_N$ Pe | 14 24 29 | ... | ... | ... | 1500 | Slight. Probable origin in Nepal. Agra △ = 500 kms. |
| | S | 14 27 6 | ... | ... | ... | ... | |
| | L | 14 28 14 | ... | ... | ... | ... | |
| | F | 14 42 0 | ... | ... | ... | ... | |
| ,, 8th | $A_E$ P | 14 24 29 | ... | ... | ... | 1500 | Do. |
| | S | 14 27 6 | ... | ... | ... | ... | |
| | L | 14 28 14 | ... | ... | ... | ... | |
| | F | 14 42 0 | ... | ... | ... | ... | |
| ,, 14th | $A_N$ e | 14 25 0 | ... | ... | ... | ... | Tremors. |
| | f | 14 59 0 | ... | ... | ... | ... | |
| ,, 14th | $A_E$ e | 14 25 0 | ... | ... | ... | ... | Do. |
| | F | 14 41 0 | ... | ... | ... | ... | |
| ,, 15th | $A_N$ e | 5 2 0 | ... | ... | ... | ... | Do. |
| | f | 5 22 0 | ... | ... | ... | ... | |
| ,, 15th | $A_E$ e | 5 3 0 | ... | ... | ... | ... | Do. |
| | f | 5 21 0 | ... | ... | ... | ... | |
| ,, 18th | $A_N$ e | 4 17 0 | ... | ... | ... | ... | Do. |
| | f | 4 28 0 | ... | ... | ... | ... | |
| ,, 18th | $A_E$ e | 4 17 0 | ... | ... | ... | ... | Do. |
| | f | 4 26 0 | ... | ... | ... | ... | |
| ,, 18th | $A_N$ | 17 12 0 | ... | ... | ... | ... | Do. |
| | f | 18 20 0 | ... | ... | ... | ... | |
| ,, 18th | $A_E$ e | 17 12 0 | ... | ... | ... | ... | Do |
| | f | 18 20 0 | ... | ... | ... | ... | |

TABLE D 2—*contd.*

| Date. | Phase. | Time G. M. T. | Period (Sec.) | Amplitude (μ) $A_N$ | Amplitude (μ) $A_E$ | Distance (Km.) | Remarks. |
|---|---|---|---|---|---|---|---|
| 1933. | | H. M. S. | | | | | |
| Nov. 19th | $A_N$ e | 3 28 0 | ... | ... | ... | ... | Tremors. |
| | f | 5 17 0 | ... | ... | ... | ... | |
| ,, 19th | $A_E$ e | 3 28 0 | ... | ... | ... | ... | Do. |
| | f | 5 17 0 | ... | ... | ... | ... | |
| ,, 19th | $A_N$ P | 9 14 4 | ... | ... | ... | 2880 | Slight. Epc.:—North-east frontier of Burma. Same origin as on the 5th November. |
| | S | 9 18 34 | ... | ... | ... | ... | |
| | L | 9 21 50 | ... | ... | ... | ... | |
| | F | 9 54 0 | ... | ... | ... | ... | |
| ,, 19th | $A_E$ P | 9 14 4 | ... | ... | ... | 2880 | Do. |
| | S | 9 18 34 | ... | ... | ... | ... | |
| | L | 9 21 50 | ... | ... | ... | ... | |
| | F | 9 50 0 | ... | ... | ... | ... | |
| ,, 20th-21st. | $A_N$ P | 23 34 11 | ... | ... | ... | 9200 | Great shock. Epc.—Baffin Bay. |
| | S | 23 44 30 | ... | ... | ... | ... | |
| | L | 0 4 16 | ... | ... | ... | ... | |
| | M | 0 16 32 | 22 | 101 | ... | ... | |
| | F | 3 26 0 | ... | ... | ... | ... | |
| ,, 20th-21st. | $A_E$ P | 23 34 11 | ... | ... | ... | 9200 | Do. |
| | S | 23 44 30 | ... | ... | ... | ... | |
| | L | 0 4 16 | ... | ... | ... | ... | |
| | M | 0 9 8 | 21 | ... | 80 | ... | |
| | F | 3 18 0 | ... | ... | ... | ... | |
| ,, 22nd | $A_N$ e | 1 4 0 | ... | ... | ... | ... | Tremors. |
| | f | 2 47 0 | ... | ... | ... | ... | |
| ,, 22nd | $A_E$ e | 1 1 0 | ... | ... | ... | ... | Do. |
| | f | 2 48 0 | ... | ... | ... | ... | |
| ,, 22nd | $A_N$ P | 12 54 37 | ... | ... | ... | 8830 | Slight. Epc:—East of New Guinea, 3°S. 150°E. (J.S.A.) |
| | S | 13 4 45 | ... | ... | ... | ... | |
| | L | 13 24 15 | ... | ... | ... | ... | |
| | M | 13 28 23 | 23 | 14 | ... | ... | |
| | F | 16 35 0 | ... | ... | ... | ... | |
| ,, 22nd | $A_E$ P | 12 54 37 | ... | ... | ... | 8830 | Do. |
| | S | 13 4 45 | ... | ... | ... | ... | |
| | L | 13 22 15 | ... | ... | ... | ... | |
| | M | 13 32 37 | 23 | ... | 10 | ... | |
| | F | 15 47 0 | ... | ... | ... | ... | |
| ,, 22nd | $A_N$ e | 18 24 0 | ... | ... | ... | ... | Tremors |
| | f | 18 44 0 | ... | ... | ... | ... | |
| ,, 22nd | $A_E$ e | 18 30 0 | ... | ... | ... | ... | Do. |
| | f | 18 46 0 | ... | ... | ... | ... | |
| 1933. | | H. M. S. | | | | | |
| Nov. 22nd | $A_N$ e | 22 48 0 | ... | ... | ... | ... | Tremors. |
| | f | 23 28 0 | ... | ... | ... | ... | |
| ,, 22nd | $A_E$ e | 22 48 0 | ... | ... | ... | ... | Do. |
| | f | 23 29 0 | ... | ... | ... | ... | |
| ,, 23rd | $A_N$ e | 18 53 0 | ... | ... | ... | ... | Do. |
| | f | 19 57 0 | ... | ... | ... | ... | |
| | $A_E$ e | 18 53 0 | ... | ... | ... | ... | Do. |
| | f | 20 0 0 | ... | ... | ... | ... | |
| ,, 23rd | $A_N$ e | 20 16 0 | ... | ... | ... | ... | Do. |
| | f | 20 54 0 | ... | ... | ... | ... | |
| ,, 23rd | $A_E$ e | 20 14 0 | ... | ... | ... | ... | Do. |
| | f | 20 48 0 | ... | ... | ... | ... | |
| ,, 24th | $A_N$ e | 4 3 0 | ... | ... | ... | ... | Do. |
| | f | 4 19 0 | ... | ... | ... | ... | |
| ,, 24th | $A_E$ e | 4 3 0 | ... | ... | ... | ... | Do. |
| | f | 4 16 0 | ... | ... | ... | ... | |
| ,, 24th | $A_N$ e | 8 16 0 | ... | ... | ... | ... | Do. |
| | f | 8 24 0 | ... | ... | ... | ... | |
| ,, 24th | $A_E$ e | 8 16 0 | ... | ... | ... | ... | Do. |
| | f | 8 24 0 | ... | ... | ... | ... | |
| ,, 25th | $A_N$ e | 1 18 0 | ... | ... | ... | ... | Do. |
| | f | 1 23 0 | ... | ... | ... | ... | |
| ,, 25th | $A_E$ e | 1 18 0 | ... | ... | ... | ... | Do. |
| | f | 1 30 0 | ... | ... | ... | ... | |
| ,, 28th | $A_N$ e | 8 22 0 | ... | ... | ... | ... | Do. |
| | f | 8 39 0 | ... | ... | ... | ... | |
| ,, 28th | $A_E$ e | 8 22 0 | ... | ... | ... | ... | Do. |
| | f | 8 40 0 | ... | ... | ... | ... | |
| ,, 28th | $A_N$ P | 11 13 51 | ... | ... | ... | 2430 | Moderate. Epc:—North Persia, 35° N. 57° E. Nanking △ = 5720 kms. |
| | S | 11 17 49 | ... | ... | ... | ... | |
| | L | 11 19 59 | ... | ... | ... | ... | |
| | M | 11 27 19 | 11 | 27 | ... | ... | |
| | F | 13 10 0 | ... | ... | ... | ... | |
| ,, 28th | $A_E$ P | 11 13 51 | ... | ... | ... | 2430 | Do. |
| | S | 11 17 49 | ... | ... | ... | ... | |
| | L | 11 19 59 | ... | ... | ... | ... | |
| | M | 11 25 19 | 12 | ... | 26 | ... | |
| | F | 13 17 0 | ... | ... | ... | ... | |
| 1933. | | H. M. S. | | | | | |
| Nov. 28th | $A_N$ e | 16 8 0 | ... | ... | ... | ... | Tremors. |
| | f | 16 33 0 | ... | ... | ... | ... | |
| ,, 28th | $A_E$ e | 16 8 0 | ... | ... | ... | ... | Do. |
| | f | 16 30 0 | ... | ... | ... | ... | |
| ,, 29th | $A_N$ P | 3 4 7 | ... | ... | ... | ... | Very feeble, distant. |
| | S | 3 8 30 | ... | ... | ... | ... | |
| | M | 3 12 15 | 8 | 2 | ... | ... | |
| | F | 3 26 0 | ... | ... | ... | ... | |
| ,, 29th | $A_E$ P | 3 4 7 | ... | ... | ... | ... | Do. |
| | S | 3 8 30 | ... | ... | ... | ... | |
| | M | 3 13 45 | 7 | ... | 1 | ... | |
| | F | 3 26 0 | ... | ... | ... | ... | |
| ,, 29th | $A_N$ e | 6 24 0 | ... | ... | ... | ... | Tremors. |
| | f | 7 4 0 | ... | ... | ... | ... | |
| ,, 29th | $A_E$ e | 6 23 0 | ... | ... | ... | ... | Do. |
| | f | 7 4 0 | ... | ... | ... | ... | |
| Dec. 1st | $A_N$ e | 10 48 0 | ... | ... | ... | ... | Do. |
| | f | 11 4 0 | ... | ... | ... | ... | |
| ,, 1st | $A_E$ e | 10 48 0 | ... | ... | ... | ... | Do. |
| | f | 11 2 0 | ... | ... | ... | ... | |
| ,, 2nd | $A_N$ e | 2 19 22 | ... | ... | ... | ... | Very feeble, distant |
| | F | 2 50 0 | ... | ... | ... | ... | |
| ,, 2nd | $A_E$ e | Lost while changing paper. | | | | | |
| | M | 2 25 30 | ... | ... | ... | ... | Do. |
| | F | 2 45 0 | ... | ... | ... | ... | |
| ,, 2nd | $A_N$ eP | 5 34 45 | ... | ... | ... | ... | Do. |
| | M | 6 19 30 | 15 | 3 | ... | ... | |
| | F | 7 16 0 | ... | ... | ... | ... | |
| ,, 2nd | $A_E$ eP | 5 34 45 | ... | ... | ... | ... | Do. |
| | M | 6 19 45 | 15 | ... | 2 | ... | |
| | F | 7 7 0 | ... | ... | ... | ... | |
| ,, 2nd | $A_N$ e | 8 52 0 | ... | ... | ... | ... | Tremors. |
| | f | 9 31 0 | ... | ... | ... | ... | |
| ,, 2nd | $A_E$ e | 8 51 0 | ... | ... | ... | ... | Do. |
| | f | 9 32 0 | ... | ... | ... | ... | |
| ,, 2nd | $A_N$ e | 20 26 17 | ... | ... | ... | ... | Feeble, distant. |
| | M | 21 56 40 | 15 | 3 | ... | ... | |
| | F | 22 52 0 | ... | ... | ... | ... | |

TABLE D 2—*concld.*

| Date. | Phase. | Time G. M. T. | Period (Sec.) | Amplitude (μ) $A_N$ | Amplitude (μ) $A_E$ | Distance (Km). | Remarks. |
|---|---|---|---|---|---|---|---|
| 1933. | $A_N$ | H. M. S. | | | | | |
| Dec. 3rd | e | 13 20 0 | ... | ... | ... | ... | Tremors. |
| | f | 13 39 0 | ... | ... | ... | ... | |
| | $A_E$ | | | | | | |
| | e | 13 19 0 | ... | ... | ... | ... | |
| „ 3rd | f | 13 36 0 | ... | ... | ... | ... | |
| | $A_N$ | | | | | | |
| | P | 14 45 13 | ... | ... | ... | 2200 | Slight. Origin in Assam near Cherrapunji hill's. Felt at Cherrapunji, Shillong and Gauhati. |
| „ 4th | S | 14 48 49 | ... | ... | ... | | |
| | F | 16 20 0 | ... | ... | ... | ... | |
| | $A_N$ | | | | | | |
| | e | 19 34 27 | ... | ... | ... | ... | Feeble. very |
| | e | 19 43 57 | ... | ... | ... | ... | distant. |
| | F | 20 47 0 | ... | ... | ... | ... | |
| „ 6th | $A_E$ | | | | | | |
| | e | 0 7 0 | ... | ... | ... | ... | Tremors. |
| | f | 0 28 0 | ... | ... | ... | ... | |
| | $A_E$ | | | | | | |
| „ 9th | eP | 7 56 14 | ... | ... | ... | 1950 | Slight. Probable origin in Afghanistan. |
| | S | 7 59 29 | ... | ... | ... | ... | |
| | eL | 8 1 0 | ... | ... | ... | ... | |
| | F | 8 36 0 | ... | ... | ... | ... | |
| | $A_N$ | | | | | | |
| „ 12th | e | 3 8 0 | ... | ... | ... | ... | Tremors. |
| | f | 3 18 0 | ... | ... | ... | ... | |
| | $A_E$ | | | | | | |
| „ 12th | e | 3 8 0 | ... | ... | ... | ... | Do. |
| | f | 3 18 0 | ... | ... | ... | ... | |
| | $A_N$ | | | | | | |
| „ 12th | i | 5 26 11 | ... | ... | ... | ... | Very feeble, distant. |
| | i | 5 30 6 | ... | ... | ... | ... | |
| | M | 5 40 37 | ... | ... | ... | ... | |
| | F | 6 6 0 | ... | ... | ... | ... | |
| | $A_E$ | | | | | | |
| „ 12th | i | 5 26 11 | ... | ... | ... | ... | Do. |
| | i | 5 30 6 | ... | ... | ... | ... | |
| | M | 5 38 52 | ... | ... | ... | ... | |
| | F | 5 53 0 | ... | ... | ... | ... | |
| | $A_N$ | | | | | | |
| „ 12th | P | 14 23 37 | ... | ... | ... | 9440 | Slight. Epc:— East New Guinea, 6° S., 153°E. Perth (S-P) △ = 4340 kms Nanking △ = 5300 kms Do. |
| | Sc Pc S | 14 33 45 | ... | ... | ... | ... | |
| | SR1 | 14 39 45 | ... | ... | ... | ... | |
| | M | 15 5 32 | 18 | 4 | ... | ... | |
| | F | 16 52 0 | ... | ... | ... | ... | |
| „ 12th | $A_E$ | | | | | | |
| | P | 14 23 37 | ... | ... | ... | 9440 | |
| | Sc Pc S | 14 33 45 | ... | ... | ... | ... | |
| | SR1 | 14 39 45 | ... | ... | ... | ... | |
| | M | 15 3 47 | 19 | ... | 5 | ... | |
| | F | 17 9 0 | ... | ... | ... | ... | |

| Date. | Phase. | Time G. M. T. | Period (Sec.) | Amplitude (μ) $A_N$ | Amplitude (μ) $A_E$ | Distance (Km.) | Remarks. |
|---|---|---|---|---|---|---|---|
| 1933. | | H. M. S. | | | | | |
| | $A_N$ | | | | | | |
| Dec. 13th | P | 21 43 9 | ... | ... | ... | 16350 | Slight. Epc:— Pacific Ocean off Central America, 18° N., 140° W. (U. S. C.G.S.) |
| | PR | 21 46 27 | ... | ... | ... | ... | |
| | Sc Pc PcS | 21 53 24 | ... | ... | ... | ... | |
| | SR | 22 5 43 | ... | ... | ... | ... | |
| | M | 23 4 43 | 17 | 5 | ... | ... | |
| | F | 23 52 0 | ... | ... | ... | ... | |
| | $A_E$ | | | | | | |
| „ 13th | P | 21 43 9 | ... | ... | ... | 16350 | Do. |
| | eL | 22 24 0 | ... | ... | ... | ... | |
| | M | 22 55 58 | 16 | ... | 6 | ... | |
| | F | 23 57 0 | ... | ... | ... | ... | |
| | $A_N$ | | | | | | |
| „ 14th | e | 8 34 0 | ... | ... | ... | ... | Tremors. |
| | f | 8 56 0 | ... | ... | ... | ... | |
| | $A_E$ | | | | | | |
| | e | 8 27 0 | ... | ... | ... | ... | Do. |
| | f | 8 56 0 | ... | ... | ... | ... | |
| | $A_N$ | | | | | | |
| „ 14th | eP | 12 47 17 | ... | ... | ... | 2270 | Slight, Epc:— North of Andaman Islands, 14° N., 94° E. (Tentative), |
| | eS | 12 51 3 | ... | ... | ... | ... | |
| | L | 12 52 56 | ... | ... | ... | ... | |
| | M | 12 54 26 | 7 | 4 | ... | ... | |
| | F | 13 10 0 | ... | ... | ... | ... | |
| | $A_E$ | | | | | | |
| | eP | 12 47 17 | ... | ... | ... | ... | |
| | eS | 12 51 3 | ... | ... | ... | ... | |
| | L | 12 52 56 | ... | ... | ... | ... | |
| | M | 12 54 50 | 7 | ... | 3 | ... | |
| | F | 13 7 0 | ... | ... | ... | ... | |
| | $A_N$ | | | | | | |
| „ 14th | P | 18 56 21 | ... | ... | ... | 2340 | Slight. Epc:— Same as in previous shock. |
| | S | 19 0 14 | ... | ... | ... | ... | |
| | L | 19 2 25 | ... | ... | ... | ... | |
| | F | 19 35 0 | ... | ... | ... | ... | |
| | $A_E$ | | | | | | |
| „ 14th | P | 18 56 21 | ... | ... | ... | 2340 | Do. |
| | S | 19 0 14 | ... | ... | ... | ... | |
| | L | 19 2 25 | ... | ... | ... | ... | |
| | F | 19 42 0 | ... | ... | ... | ... | |
| | $A_N$ | | | | | | |
| „ 17th | e | 23 10 0 | ... | ... | ... | ... | Tremors. |
| | f | 23 33 0 | ... | ... | ... | ... | |
| | $A_E$ | | | | | | |
| „ 17th | e | 23 15 0 | ... | ... | ... | ... | Do. |
| | f | 23 38 0 | ... | ... | ... | ... | |
| | $A_N$ | | | | | | |
| „ 18th | e | 10 29 0 | ... | ... | ... | ... | Feeble distant. |
| | M | 10 38 26 | 11 | 1 | ... | ... | |
| | F | 11 12 0 | ... | ... | ... | ... | |

| Date. | Phase. | Time C. M. T. | Period (Sec.) | Amplitude (μ) $A_N$ | Amplitude (μ) $A_E$ | Distance (Km.) | Remarks. |
|---|---|---|---|---|---|---|---|
| 1933. | | H. M. S. | | | | | |
| | $A_E$ | | | | | | |
| Dec. 18th | e | 10 29 0 | ... | ... | ... | ... | Feeble distant. |
| | M | 10 57 7 | 11 | ... | 1 | ... | |
| | F | 11 11 0 | ... | ... | ... | ... | |
| | $A_N$ | | | | | | |
| „ 19th | i | 5 56 53 | ... | ... | ... | ... | Very feeble, very distant. |
| | i | 6 0 4 | ... | ... | ... | ... | |
| | F | 6 39 0 | ... | ... | ... | ... | |
| | $A_N$ | | | | | | |
| „ 24th | e | 10 57 56 | ... | ... | ... | ... | Do. |
| | i | 11 7 37 | ... | ... | ... | ... | |
| | F | 12 35 0 | ... | ... | ... | ... | |
| | $A_E$ | | | | | | |
| „ 24th | e | 10 57 56 | ... | ... | ... | ... | Do. |
| | i | 11 7 37 | ... | ... | ... | ... | |
| | F | 12 40 0 | ... | ... | ... | ... | |
| | $A_N$ | | | | | | |
| „ 24th | e | 18 9 0 | ... | ... | ... | ... | Tremors. |
| | f | 18 21 0 | ... | ... | ... | ... | |
| | $A_E$ | | | | | | |
| | e | 18 9 0 | ... | ... | ... | ... | Do. |
| | f | 18 20 0 | ... | ... | ... | ... | |
| | $A_N$ | | | | | | |
| „ 26th | e | 10 22 0 | ... | ... | ... | ... | Do. |
| | f | 10 47 0 | ... | ... | ... | ... | |
| | $A_E$ | | | | | | |
| „ 26th | e | 10 24 0 | ... | ... | ... | ... | Do. |
| | f | 10 44 0 | ... | ... | ... | ... | |
| | $A_N$ | | | | | | |
| „ 26th | e | 22 37 0 | ... | ... | ... | ... | Do. |
| | f | 22 55 0 | ... | ... | ... | ... | |
| | $A_E$ | | | | | | |
| | e | 22 37 0 | ... | ... | ... | ... | Do. |
| | f | 22 55 2 | ... | ... | ... | ... | |
| | $A_N$ | | | | | | |
| „ 27th | e | 11 47 0 | ... | ... | ... | ... | Do. |
| | f | 12 39 0 | ... | ... | ... | ... | |
| | $A_E$ | | | | | | |
| | e | 11 47 0 | ... | ... | ... | ... | Do. |
| | f | 12 52 0 | ... | ... | ... | ... | |
| | $A_N$ | | | | | | |
| „ 31st | e | 12 50 0 | ... | ... | ... | ... | Do. |
| | f | 13 17 0 | ... | ... | ... | ... | |
| | $A_E$ | | | | | | |
| „ 31st | e | 12 49 0 | ... | ... | ... | ... | Do. |
| | f | 13 23 0 | ... | ... | ... | ... | |

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# STATION—CALCUTTA (ALIPORE).

$\phi = 22° 32'$ N ; $\lambda = 88° 20'$ E ; $h = 7{\cdot}1$ metres above; M. S. L. *Subsoil*—Alluvial.

*Apparatus.*—Milne-Shaw Seismograph ($A_N$ component).

(Exposed in constant temperature room).

TABLE D 3.

| | $V_m$ | T | G | $\frac{r}{To^2}$ | Steady mass (K9). | Paper speed m m/min. | Up. |
|---|---|---|---|---|---|---|---|
| $A_N$ . . . . . | 250 | 12 sec. | 20 : 1 | ·0005 approx. | 0·45 | 8 | North. |

| Date. | Phase. | Time G. M. T. | Period (Sec.) | Amplitude ($\mu$) $A_N$ | Distance $\Delta$ (Km.) | Remarks. |
|---|---|---|---|---|---|---|
| 1933. | | H. M. S. | | | | |
| Jan. 1st | P | 9 3 1 | 3 | ... | 3350 | Slight. |
| | S | 9 8 11 | 4 | ... | ... | |
| | L | 9 13 11 | 6 | ... | ... | |
| | F | ? | ... | ... | ... | |
| ,, 1st | eP | 19 54 16 | ? | ... | 300 | Do. |
| | S | ? | ? | ... | ... | |
| | L | 19 55 1 | 4 | ... | ... | |
| | F | ? | ... | ... | ... | |
| ,, 3rd | eP | 15 33 4 | 3 | ... | 6900 | Do. |
| | S | 15 41 33 | 5 | ... | ... | |
| | L | 15 54 49 | 10 | ... | ... | |
| | F | 16 42 19 | ... | ... | ... | |
| ,, 4th | P | 4 11 50 | 4 | ... | 9600 | Do. |
| | S | 4 22 28 | 7 | ... | ... | |
| | L | 4 44 50 | 10 | ... | ... | |
| | F | 5 25 35 | ... | ... | ... | |
| ,, 7th | P | 4 15 40 | 2 | ... | 5600 | Moderate |
| | S | 4 22 52 | 5 | ... | ... | |
| | L | 4 33 3 | 13 | ... | ... | |
| | M | 4 38 23 | ... | 27 | ... | |
| | F | 6 38 33 | ... | ... | | |
| ,, 8th | P | 6 1 32 | 4 | ... | 6250 | Slight. |
| | S | 6 9 27 | 6 | ... | ... | |
| | L | 6 21 27 | 13 | ... | ... | |
| | F | ? | ... | ... | ... | |
| ,, 9th | P | 2 6 7 | 4 | ... | 2200 | Moderate |
| | S | 2 9 52 | 8 | ... | ... | |
| | L | ? | ... | ... | ... | |
| | M | ? | ... | ... | ... | |
| | F | 3 40 7 | ... | ... | ... | |
| 1933. | | H. M. S. | | | | |
| Jan. 9th | P | 8 51 2 | 2 | ... | 2100 | Slight. |
| | S | 8 54 32 | 5 | ... | ... | |
| | L | 8 56 35 | 6 | ... | ... | |
| | F | ? | ... | ... | ... | |
| ,, 17th | P | 16 2 33 | 5 | ... | 2100 | Do. |
| | S | 16 6 15 | 8 | ... | ... | |
| | L | 16 8 23 | 10 | ... | ... | |
| | F | 16 40 53 | ... | ... | ... | |
| ,, 17th | P | 18 57 6 | 2 | ... | 7050 | Do. |
| | S | 19 5 40 | 5 | ... | ... | |
| | L | 19 19 40 | 15 | ... | ... | |
| | F | 20 14 40 | ... | ... | ... | |
| ,, 20th | eP | 12 16 31 | ? | ... | 1650 | Do. |
| | S | 12 19 13 | 3 | ... | ... | |
| | L | 12 20 55 | 5 | ... | ... | |
| | F | 12 39 55 | ... | ... | ... | |
| ,, 21st | P | 16 28 6 | 4 | ... | 3700 | Do. |
| | S | 16 33 26 | 7 | ... | ... | |
| | L | 16 38 26 | 10 | ... | ... | |
| | F | ? | ... | ... | ... | |
| ,, 21st | P | 19 31 3 | 4 | ... | 6250 | Great. |
| | S | 19 39 5 | 10 | ... | ... | |
| | L | 19 50 26 | 16 | ... | ... | |
| | | 19 54 31 | ... | 151 | ... | |
| | F | 21 1 31 | ... | ... | ... | |
| ,, 23rd | P | 0 9 41 | 2 | ... | 1200 | Slight. |
| | S | 0 11 51 | 5 | ... | ... | |
| | L | 0 12 41 | 8 | ... | ... | |
| | F | 0 28 11 | ... | ... | ... | |
| 1933. | | H. M. S. | | | | |
| Jan. 24th | P | 4 53 30 | 2 | ... | 950 | Slight. |
| | S | 4 55 18 | 3 | ... | ... | |
| | L | 4 56 0 | 5 | ... | ... | |
| | M | 4 56 50 | ... | 33 | ... | |
| | F | 5 16 40 | ... | ... | ... | |
| ,, 26th | P | 22 37 32 | ? | ... | 450 | Do. |
| | S | 22 38 17 | 3 | ... | ... | |
| | L | 22 38 39 | 5 | ... | ... | |
| | F | 23 7 9 | ... | ... | ... | |
| ,, 30th | eP | 20 31 12 | ? | ... | 2100 | Do. |
| | S | 20 34 49 | 4 | ... | ... | |
| | L | 20 36 42 | 5 | ... | ... | |
| | F | ? | ... | ... | ... | |
| Feb. 3rd | P | 22 20 57 | 4 | ... | 6400 | Do. |
| | S | 22 28 51 | 6 | ... | ... | |
| | L | 22 42 32 | 14 | ... | ... | |
| | F | 23 37 47 | ... | ... | ... | |
| ,, 13th | P | 2 24 26 | 4 | ... | 2650 | Moderate |
| | S | 2 28 46 | 6 | ... | ... | |
| | eL | 2 31 28 | 10 | ... | ... | |
| | F | 3 43 46 | ... | ... | ... | |
| ,, 13th | P | 4 28 32 | 3 | ... | 2300 | Slight. |
| | S | 4 32 24 | 5 | ... | ... | |
| | L | 4 34 17 | 8 | ... | ... | |
| | F | 5 8 17 | ... | ... | ... | |
| ,, 21st | eP | 19 10 27 | 5 | ... | 3000 | Do. |
| | S | 19 15 8 | 6 | ... | ... | |
| | L | 19 18 36 | 10 | ... | ... | |
| | F | 12 51 16 | ... | ... | ... | |

TABLE D 3—*contd.*

| Date. | Phase. | Time G. M. T. | Period (Sec.). | AMPLITUDE $\frac{(\mu)}{A_N}$ | Distance Δ (Km.). | Remarks. |
|---|---|---|---|---|---|---|
| 1933. | | H. M. S. | | | | |
| Feb. 22nd | P | 18 1 6 | 4 | ... | 2400 | Slight. |
| | S | 18 5 1 | 6 | ... | ... | |
| | L | 18 7 10 | 8 | ... | ... | |
| | F | 18 45 50 | ... | ... | ... | |
| ,, 23rd | P | 8 28 51 | 5 | ... | 16000 | Moderate |
| | S | 8 42 51 | 9 | ... | ... | |
| | L | 9 27 9 | 18 | ... | ... | |
| | M | 9 34 24 | ... | 29 | ... | |
| | F | 11 24 49 | ... | ... | ... | |
| March 2nd | P | 17 40 14 | 10 | ... | 5450 | Very great Japan Earthquake. |
| | S | 17 47 35 | 15 | ... | ... | |
| | L | 17 57 42 | 22 | ... | ... | |
| | M | 18 2 8 | ... | 162 | ... | |
| | F | 22 28 19 | ... | ... | ... | |
| ,, 3rd | P | 9 18 24 | 3 | ... | 5450 | Slight. |
| | S | 9 25 39 | 5 | ... | ... | |
| | L | 9 36 24 | 10 | ... | ... | |
| | F | ? | ... | ... | ... | |
| , 3rd | P | 16 36 49 | ? | ... | 300 | Do. |
| | S | 16 37 34 | ? | ... | ... | |
| | L | 16 37 49 | 3 | ... | ... | |
| | F | ? | ... | ... | ... | |
| ,, 5th | P | 8 26 14 | 3 | ... | 2550 | Do. |
| | S | 8 30 14 | 5 | ... | ... | |
| | L | 8 32 59 | 7 | ... | ... | |
| | F | 9 21 59 | ... | ... | ... | |
| ,, 11th | P | 14 31 6 | 5 | ... | 6000 | Do. |
| | S | 14 38 38 | 7 | ... | ... | |
| | L | 14 50 23 | 13 | ... | ... | |
| | F | 16 21 33 | ... | ... | ... | |
| ,, 11th | P | 19 40 48 | 4 | ... | 2400 | Do. |
| | S | 19 44 49 | 5 | ... | ... | |
| | L | 19 47 20 | 7 | ... | ... | |
| | F | 21 5 20 | ... | ... | ... | |
| ,, 12th | eP | 0 4 10 | 2 | ... | 3500 | Do. |
| | S | 0 9 27 | 6 | ... | ... | |
| | L | 0 14 8 | 10 | ... | ... | |
| | F | ? | ... | ... | .. | |
| ,, 14th | P | 2 5 55 | 2 | ... | 480 | Do. |
| | S | 2 6 42 | 3 | ... | ... | |
| | L | 2 7 0 | 5 | ... | ... | |
| | F | ? | | ... | ... | |
| ,, 17th | P | 16 5 37 | 5 | ... | 7700 | Moderate |
| | S | 16 14 37 | 7 | ... | ... | |
| | L | 16 31 7 | 16 | ... | ... | |
| | M | 16 35 57 | ... | 40 | ... | |
| | F | 18 40 37 | ... | ... | ... | |
| Mar. 17th | P | 19 40 19 | 5 | ... | 4800 | Moderate |
| | S | 19 46 49 | 6 | ... | ... | |
| | L | 19 54 39 | 15 | ... | ... | |
| | M | 20 2 24 | ... | 53 | ... | |
| | F | 21 40 54 | ... | ... | ... | |
| ,, 18th | P | 2 32 27 | 3 | ... | 7200 | Slight. |
| | S | 2 41 12 | 5 | ... | ... | |
| | L | 2 55 16 | 14 | ... | ... | |
| | F | 4 1 46 | ... | ... | ... | |
| ,, 22nd | P | 2 28 4 | 4 | ... | 2900 | Do. |
| | S | 2 32 34 | 6 | ... | ... | |
| | L | 2 36 14 | 8 | ... | ... | |
| | F | ? | ... | ... | ... | |
| ,, 23rd | P | 17 44 35 | 3 | ... | 2250 | Do. |
| | S | 17 48 17 | 5 | ... | ... | |
| | L | 18 50 47 | ? | ... | ... | |
| | F | ? | ... | ... | ... | |
| ,, 30th | P | 20 47 46 | 4 | ... | 1500 | Do. |
| | S | 20 50 14 | 6 | ... | ... | |
| | L | 20 51 42 | 8 | ... | ... | |
| | F | 21 22 22 | ... | ... | ... | |
| ,, 31st | P | 22 2 51 | 4 | ... | 1900 | Do. |
| | S | 22 6 11 | 7 | ... | ... | |
| | L | 22 7 56 | 10 | ... | ... | |
| | F | 22 39 41 | ... | ... | ... | |
| April 9th | P | 2 55 32 | 4 | ... | 5300 | Do. |
| | S | 3 2 38 | 6 | ... | ... | |
| | L | 3 11 44 | 10 | ... | ... | |
| | F | ? | ... | ... | ... | |
| ,, 16th | P | 19 27 19 | 4 | ... | 2700 | Do. |
| | S | 19 31 42 | 5 | ... | ... | |
| | L | 19 34 57 | 7 | ... | ... | |
| | F | 20 32 27 | ... | ... | ... | |
| ,, 17th | P | 4 18 54 | 2 | ... | 560 | Do. |
| | S | 4 19 46 | 4 | ... | ... | |
| | L | 4 20 16 | 7 | ... | ... | |
| | F | ? | ... | ... | ... | |
| ,, 19th | P | 6 50 46 | 5 | ... | 3500 | Moderate |
| | S | 6 56 8 | 7 | ... | ... | |
| | L | 7 1 20 | 10 | ... | ... | |
| | M | 7 3 20 | ... | 43 | ... | |
| | F | 8 2 20 | ... | ... | ... | |
| ,, 23rd | P | 6 6 59 | 5 | ... | 6550 | Do. |
| | S | 6 15 10 | 7 | ... | ... | |
| | L | 6 27 21 | 14 | ... | ... | |
| | M | 6 29 31 | ... | 19 | ... | |
| | F | ? | ... | ... | ... | |
| Apr. 23rd | P | 7 21 3 | 5 | ... | 6250 | Moderate |
| | S | 7 28 53 | 7 | ... | ... | |
| | L | 7 40 53 | 14 | ... | ... | |
| | M | 7 46 13 | ... | 13 | ... | |
| | F | 9 10 53 | ... | ... | ... | |
| ,, 27th | P | 2 48 53 | 5 | ... | 9100 | Great. |
| | S | 2 59 17 | 8 | ... | ... | |
| | L | 3 19 5 | 16 | ... | ... | |
| | $M_1$ | 3 27 5 | ... | 63 | ... | |
| | $M_2$ | 3 30 35 | ... | 119 | ... | |
| | F | 6 10 5 | ... | ... | ... | |
| ,, 28th | P | 7 50 13 | ? | ... | 1050 | Slight. |
| | S | 7 52 1 | 3 | ... | ... | |
| | L | 7 52 43 | 5 | ... | ... | |
| | F | ? | ... | ... | ... | |
| May 3rd | P | 23 44 18 | 4 | ... | 2700 | Do. |
| | S | 23 48 35 | 6 | ... | ... | |
| | L | 23 51 38 | 8 | ... | ... | |
| ,, 4th | F | 0 4 36 | ... | ... | ... | |
| ,, 8th | P | 10 56 22 | 5 | ... | 12300 | Do. |
| | S | 11 8 59 | 8 | ... | ... | |
| | L | 11 39 30 | 24 | ... | ... | |
| | F | 13 11 0 | ... | ... | ... | |
| ,, 11th | P | 19 21 43 | 5 | ... | 6250 | Do. |
| | S | 19 29 31 | 7 | ... | ... | |
| | L | 19 41 31 | 10 | ... | ... | |
| | F | 20 35 41 | ... | ... | ... | |
| ,, 12th | P | 16 11 0 | ? | ... | 1100 | Do. |
| | S | 16 13 28 | 7 | ... | ... | |
| | L | 16 14 9 | 10 | ... | ... | |
| | F | 16 43 59 | ... | ... | ... | |
| ,, 18th | P | 10 27 11 | 3 | ... | 750 | Do. |
| | S | 10 28 30 | 4 | ... | ... | |
| | L | 10 29 7 | 6 | ... | ... | |
| | F | 11 23 17 | ... | ... | ... | |
| ,, 18th | P | 18 21 25 | 6 | ... | 7050 | Do. |
| | S | 18 30 0 | 8 | ... | ... | |
| | L | 18 43 40 | 17 | ... | ... | |
| | F | 20 7 40 | ... | ... | ... | |
| ,, 24th | eP | 3 17 38 | 2 | ... | 500 | Do. |
| | S | 3 18 24 | 4 | ... | ... | |
| | L | 3 18 52 | 5 | ... | ... | |
| | F | ? | ... | ... | ... | |

TABLE D 3—*contd.*

| Date. | Phase. | Time G. M. T. | Period (Sec.). | Amplitude ($\mu$)/$A_N$ | Distance $\Delta$ (Km.). | Remarks. |
|---|---|---|---|---|---|---|
| 1933. | | H. M. S. | | | | |
| May, 26th | eP | 14 26 39 | 2 | ... | 400 | Slight. |
| | S | 14 27 15 | 3 | ... | ... | |
| | L | 14 27 45 | 5 | ... | ... | |
| | F | ? | ... | ... | ... | |
| June 6th | eP | 2 39 59 | 5 | ... | 3350 | Do. |
| | S | 2 45 26 | 7 | ... | ... | |
| | L | 2 46 14 | 10 | ... | ... | |
| | F | ? | ... | ... | ... | |
| ,, 7th | eP | 11 48 56 | 4 | ... | 1100 | Moderate |
| | S | 11 50 52 | 6 | ... | ... | |
| | L | 11 51 46 | 10 | ... | ... | |
| | F | ? | ... | ... | ... | |
| ,, 7th | P | 18 20 4 | 4 | ... | 5400 | Slight. |
| | S | 18 27 12 | 7 | ... | ... | |
| | L | 18 36 40 | 10 | ... | ... | |
| | F | 19 25 10 | ... | ... | ... | |
| ,, 13th | eP | 20 49 29 | 4 | ... | 4150 | Do. |
| | eS | 20 55 34 | 7 | ... | ... | |
| | L | 21 1 34 | 10 | ... | ... | |
| | F | ? | ... | ... | ... | |
| ,, 18th | P | 21 47 24 | 5 | ... | 5200 | Moderate |
| | S | 21 54 18 | 7 | ... | ... | |
| | L | 22 3 11 | 14 | ... | ... | |
| | M | 22 7 51 | ... | 39 | ... | |
| | F | ? | ... | ... | ... | |
| ,, 25th | P | 5 54 9 | 3 | ... | 3200 | Slight. |
| | eS | 5 59 9 | ? | ... | ... | |
| | L | 6 2 53 | 5 | ... | ... | |
| | F | ? | ... | ... | ... | |
| July 3rd | eP | 15 11 30 | 2 | ... | 1600 | Do. |
| | S | 15 14 11 | 4 | ... | ... | |
| | L | 15 15 42 | 8 | ... | ... | |
| | F | ? | ... | ... | ... | |
| ,, 7th | eP | 7 41 39 | 3 | ... | 1050 | Do. |
| | S | 7 43 35 | 5 | ... | ... | |
| | L | 7 44 23 | 8 | ... | ... | |
| | F | ? | ... | ... | ... | |
| ,, 8th | eP | 8 42 38 | 3 | ... | 900 | Do. |
| | S | 8 44 12 | 5 | ... | ... | |
| | L | 8 44 50 | 8 | ... | ... | |
| | F | ? | ... | ... | ... | |
| July 9th | P | 1 39 21 | 3 | .. | 6400 | Slight. |
| | S | 1 47 11 | 5 | ... | ... | |
| | eL | 2 1 1 | 10 | ... | ... | |
| | F | ? | ... | ... | ... | |
| ,, 9th | P | 12 41 12 | 4 | ... | 6400 | Moderate |
| | S | 12 49 3 | 6 | ... | ... | |
| | L | 13 2 33 | 12 | ... | ... | |
| | F | ? | ... | ... | ... | |
| ,, 13th | P | 23 11 8 | 2 | ... | 300 | Slight. |
| | S | 23 11 43 | 3 | ... | ... | |
| | L | 23 11 56 | 5 | ... | ... | |
| | F | 23 34 26 | ... | ... | ... | |
| ,, 19th | eP | 20 50 55 | ? | ... | 1200 | Do. |
| | S | 20 52 55 | 5 | ... | ... | |
| | L | 20 53 55 | 8 | ... | ... | |
| | F | ? | ... | ... | ... | |
| ,, 21st | P | 20 33 54 | 5 | .. | 10250 | Do. |
| | S | 20 45 15 | 10 | ... | ... | |
| | L | 21 8 30 | 22 | ... | ... | |
| | F | ? | ... | ... | ... | |
| ,, 22nd | P | 21 6 40 | 6 | ... | 8800 | Moderate |
| | S | 21 16 39 | 8 | ... | ... | |
| | L | 21 35 48 | 15 | ... | ... | |
| | M | 21 44 28 | ... | 21 | ... | |
| | F | 23 35 39 | ... | ... | ... | |
| Aug. 4th | eP | 17 38 27 | 2 | ... | 1050 | Slight. |
| | eS | 17 40 18 | 3 | ... | ... | |
| | eL | 17 41 1 | 5 | ... | ... | |
| | F | ? | ... | ... | ... | |
| ,, 12th | P | 7 41 41 | 4 | ... | 800 | Do. |
| | S | 7 43 11 | 5 | ... | ... | |
| | L | 7 43 49 | 10 | ... | ... | |
| | F | ? | ... | ... | ... | |
| ,, 12th | P | 17 5 46 | 4 | ... | 1750 | Do. |
| | S | 17 8 49 | 5 | ... | ... | |
| | L | 17 10 28 | 8 | ... | ... | |
| | F | ? | ... | ... | ... | |
| Aug. 13th | P | 9 38 25 | 4 | ... | 7150 | Slight. |
| | S | 9 46 55 | 6 | ... | ... | |
| | L | 10 0 55 | 15 | ... | ... | |
| | F | 11 3 55 | ... | ... | ... | |
| ,, 14th | P | 22 18 33 | 4 | ... | 3350 | Do. |
| | S | 22 23 41 | 6 | ... | ... | |
| | L | 22 27 52 | 8 | ... | ... | |
| | F | 22 52 22 | ... | ... | ... | |
| ,, 15th | eP | 3 6 46 | ? | ... | 5440 | Very slight. |
| | S | 3 13 59 | 3 | ... | ... | |
| | L | 3 23 31 | 5 | ... | ... | |
| | F | ? | ... | ... | ... | |
| ,, 20th | eP | 11 55 25 | 5 | ... | 4300 | Moderate |
| | S | 12 1 28 | 7 | ... | ... | |
| | L | 12 7 25 | 15 | ... | ... | |
| | M | 12 10 55 | ... | 11 | ... | |
| | F | 13 14 25 | ... | ... | ... | |
| ,, 28th | P | 22 39 54 | 5 | ... | 12500 | Do. |
| | S | 22 53 4 | 8 | ... | ... | |
| | L | 23 19 41 | 20 | ... | ... | |
| | M | 23 21 41 | ... | 58 | ... | |
| | F | 2 31 4 | ... | ... | ... | |
| ,, 29th | P | 15 13 12 | 4 | ... | 6700 | Slight. |
| | S | 15 21 27 | 7 | ... | ... | |
| | L | 15 34 27 | 12 | ... | ... | |
| | F | ? | ... | ... | ... | |
| Sep. 6th | eP | 22 21 35 | 4 | ... | 3050 | Moderate |
| | S | 22 25 48 | 6 | ... | ... | |
| | L | 22 31 08 | 9 | ... | ... | |
| | F | ? | ... | ... | ... | |
| ,, 9th | P | 5 2 48 | 4 | ... | 5600 | Slight. |
| | S | 5 9 52 | 5 | ... | ... | |
| | L | 5 19 12 | 7 | ... | ... | |
| | F | ? | ... | ... | ... | |
| ,, 9th | eP | 21 32 23 | ? | ... | 2500 | Do. |
| | S | 21 36 3 | 5 | ... | ... | |
| | eL | 21 40 3 | 8 | ... | ... | |
| | F | ? | ... | ... | ... | |
| ,, 24th | P | 15 32 8 | 4 | ... | 8550 | Do. |
| | S | 15 41 42 | 5 | ... | ... | |
| | L | 16 1 45 | 8 | ... | ... | |
| | F | 16 59 45 | ... | ... | ... | |
| ,, 25th | P | 18 54 6 | 5 | ... | 1900 | Moderate |
| | S | 18 57 4 | 6 | ... | ... | |
| | L | 18 59 7 | 10 | ... | ... | |
| | M | 19 1 17 | ... | 33 | ... | |
| | F | 21 2 32 | ... | ... | ... | |

TABLE D 3—*concld.*

| Date. | Phase. | Time G. M. T. | Period (Sec.) | Ampli tude (μ) / A N | Distance (Km.). | Remarks. |
|---|---|---|---|---|---|---|
| 1933. | | H. M. S. | | | | |
| Sept. 30th | P | 14 30 2 | 3 | ... | 6100 | Slight. |
| | S | 14 37 37 | 6 | ... | ... | |
| | L | 14 49 44 | 15 | ... | ... | |
| | F | 16 8 19 | ... | ... | ... | |
| Oct. 2nd | P | 15 51 19 | 6 | ... | 14900 | Moderate |
| | S | 16 5 11 | 8 | ... | ... | |
| | eL | 16 45 20 | 22 | ... | ... | |
| | M | 16 56 50 | ... | 48 | ... | |
| | F | 18 12 20 | ... | ... | ... | |
| ,, 5th | P | 13 36 42 | 4 | ... | 3500 | Do. |
| | S | 13 42 2 | 5 | ... | ... | |
| | L | 13 46 37 | 10 | ... | ... | |
| | M | ? | ... | ... | ... | |
| | F | 15 4 57 | ... | ... | ... | |
| 16th | P | 4 40 22 | 5 | ... | 2550 | Slight |
| | S | 4 44 36 | 7 | ... | ... | |
| | L | 4 47 2 | 10 | ... | ... | |
| | F | ? | ... | ... | ... | |
| ,, 22nd | P | 14 12 13 | 4 | ... | 2000 | Do. |
| | S | 14 15 37 | 5 | ... | ... | |
| | L | 14 17 30 | 8 | ... | ... | |
| | F | 14 46 37 | ... | ... | ... | |
| ,, 23rd | P | 12 45 19 | 4 | ... | 1600 | Do. |
| | S | 12 48 1 | 5 | ... | ... | |
| | L | 12 49 32 | 7 | ... | ... | |
| | F | ? | ... | ... | ... | |
| ,, 24th | P | 5 32 20 | 3 | ... | 1900 | Do. |
| | S | 5 35 23 | 5 | ... | ... | |
| | L | 5 37 19 | 8 | ... | ... | |
| | F | 5 53 14 | ... | ... | ... | |
| ,, 25th | P | 23 47 51 | 5 | ... | 7050 | Do. |
| | S | 23 56 15 | 8 | ... | ... | |
| ,, 26th | L | 0 10 50 | 14 | ... | ... | |
| | F | 1 49 24 | ... | ... | ... | |
| ,, 26th | P | 7 1 16 | 2 | ... | 1500 | Do. |
| | S | 7 3 59 | 5 | ... | ... | |
| | L | 7 5 13 | 8 | ... | ... | |
| | F | ? | ... | ... | ... | |
| ,, 26th | P | 12 30 13 | 4 | ... | 12150 | Do. |
| | S | 12 42 13 | 8 | ... | ... | |
| | L | 13 12 46 | 22 | ... | ... | |
| | F | 14 56 46 | ... | ... | ... | |
| ,, 30th | P | 11 37 14 | ? | ... | 900 | Do. |
| | S | 11 38 45 | 2 | ... | ... | |
| | L | 11 39 28 | 3 | ... | ... | |
| | F | ? | ... | ... | ... | |

| Date. | Phase. | Time G. M. T. | Period (Sec.) | Ampli-tude (μ) / A N | Distance (Km.). | Remarks. |
|---|---|---|---|---|---|---|
| 1933. | | H. M. S. | | | | |
| Nov. 1st | eP | 19 39 25 | ? | ... | 500 | Slight |
| | S | 19 40 18 | 3 | ... | ... | |
| | L | 19 40 43 | 5 | ... | ... | |
| | F | 19 47 25 | ... | ... | ... | |
| ,, 2nd | P | 12 39 30 | 4 | ... | 8150 | Do. |
| | S | 12 49 6 | 5 | ... | ... | |
| | L | 13 6 29 | 10 | ... | ... | |
| | F | 14 8 4 | ... | ... | ... | |
| ,, 5th | P | 20 29 36 | 4 | ... | 2200 | Moderate |
| | S | 20 33 18 | 6 | ... | ... | |
| | L | 20 35 19 | 10 | ... | ... | |
| | M | 20 39 9 | ... | 52 | ... | |
| | F | 21 32 36 | ... | ... | ... | |
| ,, 7th | P | 11 11 35 | 2 | ... | 550 | Do. |
| | S | 11 12 33 | 5 | ... | ... | |
| | L | 11 12 56 | 8 | ... | ... | |
| | F | 12 17 35 | ... | ... | ... | |
| ,, 8th | P | 14 25 50 | ? | ... | 1450 | Slight. |
| | S | 14 28 21 | 4 | ... | ... | |
| | L | 14 29 33 | 7 | ... | ... | |
| | F | 14 50 53 | ... | ... | ... | |
| ,, 19th | P | 9 12 36 | 4 | ... | 1550 | Do. |
| | S | 9 15 20 | 6 | ... | ... | |
| | L | 9 16 37 | 8 | ... | ... | |
| | M | 9 18 47 | ... | 17 | ... | |
| | F | ? | ... | ... | ... | |
| ,, 20th | P | 23 32 57 | 4 | ... | 9700 | Great. |
| | S | 23 43 17 | 7 | ... | ... | |
| ,, 21st | L | 0 3 49 | 15 | ... | ... | |
| | $M_1$ | 0 9 9 | ... | 71 | ... | |
| | $M_2$ | 0 10 9 | ... | 71 | ... | |
| | $M_3$ | 0 10 59 | ... | 71 | ... | |
| | $M_4$ | 0 11 39 | ... | 71 | ... | |
| | $M_5$ | 0 13 19 | ... | 79 | ... | |
| | $M_6$ | 0 15 59 | ... | 114 | ... | |
| | F | 3 20 19 | ... | ... | ... | |
| ,, 22nd | P | 12 44 3 | 4 | ... | 9100 | Moderate |
| | S | 12 54 20 | 6 | ... | ... | |
| | L | 13 14 31 | 15 | ... | ... | |
| | M | 13 19 51 | ... | 25 | ... | |
| | F | 16 20 1 | ... | ... | ... | |
| ,, 24th | P | 3 57 45 | 3 | ... | 1050 | Slight. |
| | S | 3 59 33 | 5 | ... | ... | |
| | L | 4 0 27 | 10 | ... | ... | |
| | F | 4 19 57 | ... | ... | ... | |

| Date. | Phase. | Time G. M. T. | Period (Sec.) | Ampli-tude (μ) / A N | Distance (Km.). | Remarks. |
|---|---|---|---|---|---|---|
| 1933. | | H. M. S. | | | | |
| Dec. 2nd | P | 2 20 21 | 3 | ... | 2550 | Slight. |
| | S | 2 24 30 | 5 | ... | ... | |
| | L | 2 27 7 | 6 | ... | ... | |
| | F | 2 45 39 | ... | ... | ... | |
| ,, 2nd | P | 20 28 12 | 5 | ... | 12150 | Do. |
| | S | 20 40 39 | 7 | ... | ... | |
| | L | 21 10 28 | 16 | ... | ... | |
| | F | 22 59 48 | ... | ... | ... | |
| ,, 4th | P | 14 41 36 | 2 | ... | 1100 | Do. |
| | S | 14 43 27 | 3 | ... | ... | |
| | L | 14 44 24 | 5 | ... | ... | |
| | F | 15 22 14 | ... | ... | ... | |
| ,, 4th | P | 19 42 24 | 5 | ... | 4000 | Do. |
| | S | 19 48 14 | 6 | ... | ... | |
| | L | 19 54 10 | 9 | ... | ... | |
| | F | 20 55 20 | ... | ... | ... | |
| ,, 9th | P | 7 57 10 | 4 | ... | 2400 | Do. |
| | S | 8 1 6 | 5 | ... | ... | |
| | L | 8 3 26 | 7 | ... | ... | |
| | F | ? | ... | ... | ... | |
| ,, 12th | P | 14 23 51 | 5 | ... | 6250 | Do. |
| | S | 14 31 50 | 7 | ... | ... | |
| | L | 14 42 50 | 10 | ... | ... | |
| | F | 15 53 50 | ... | ... | ... | |
| ,, 14th | P | 12 41 34 | 4 | ... | 500 | Moderate |
| | S | 12 42 16 | 6 | ... | ... | |
| | L | 12 42 58 | 10 | ... | ... | |
| | M | 12 43 52 | ... | 33 | ... | |
| | F | 13 10 2 | ... | ... | ... | |
| ,, 14th | eP | 18 59 20 | 5 | ... | 3500 | Slight. |
| | S | 19 4 50 | 7 | ... | ... | |
| | L | 19 8 50 | 10 | ... | ... | |
| | M | 19 11 1 | ... | 19 | ... | |
| | F | ? | ... | ... | ... | |
| ,, 24th | P | 11 3 36 | 5 | ... | 3700 | Do. |
| | eS | 11 9 6 | 6 | ... | ... | |
| | L | 11 14 2 | 8 | ... | ... | |
| | F | 12 28 18 | ... | ... | ... | |
| ,, 26th | eP | 10 20 13 | 3 | ... | 1600 | Do. |
| | S | 10 23 3 | 5 | ... | ... | |
| | L | 10 24 11 | 10 | ... | ... | |
| | F | 10 44 11 | ... | ... | ... | |

S. N. SEN,

*Meteorologist,*

*Calcutta.*

# STATION—CALCUTTA (ALIPORE).

$\varphi = 22° 32'$ ; $\lambda = 88° 20'$ ; $h = 6$ metres above M. S. L. ; *Sub-soil*—Alluvial.

*Apparatus*—Omori Ewing Seismograph ($A_N$ $A_E$ components).

TABLE D 4.

| | Vm | To | ε | $\frac{r}{To^2}$ |
|---|---|---|---|---|
| . . . . . | 32 | 28 secs. | | |
| . . . . . | 30 | 28 secs. | | |

| Date. | Phase. | Time. G. M. T. | Period (Sec.). | Amplitude (μ) A N | Amplitude (μ) A E | Distance Δ (Km.). | Remarks. |
|---|---|---|---|---|---|---|---|
| 1933. | | H. M. S. | | | | | |
| Mar. 6th | P | 13 5 45 | 2 | ... | ... | 480 | (A) N Moderate |
| | S | 13 6 30 | 4 | ... | ... | ... | |
| | L | 13 6 52 | 5 | ... | ... | ... | |
| | M | 13 7 8 | ... | 655 | ... | ... | |
| | F | 14 4 38 | ... | ... | ... | ... | |
| | P | 13 5 45 | 2 | ... | ... | ... | (A) E |
| | S | 13 6 31 | 4 | ... | ... | ... | |
| | L | 13 6 53 | 6 | ... | ... | ... | |
| | M | 13 7 11 | ... | ... | 448 | ... | |
| | F | 14 3 39 | ... | ... | ... | ... | |
| | | | | | | | (A) N |
| May 16th | P | 1 16 33 | 4 | ... | ... | 2,150 | Moderate |
| | S | 1 20 1 | 7 | ... | ... | ... | |
| | L | 1 22 25 | 16 | ... | ... | ... | |
| | M | 1 26 39 | ... | 379 | ... | ... | |
| | F | 2 11 15 | ... | ... | ... | ... | |
| | | | | | | | (A) E |
| ,, 16th | P | 1 16 35 | 5 | ... | ... | 1,900 | Moderate |
| | S | 1 20 3 | 7 | ... | ... | ... | |
| | L | 1 22 25 | 16 | ... | ... | ... | |
| | M | 1 26 49 | ... | ... | 241 | ... | |
| | F | 2 10 55 | ... | ... | ... | ... | |

| Date. | Phase. | Time. G. M. T. | Period (Sec.). | Amplitude (μ) A N | Amplitude (μ) A E | Distance Δ (Km.). | Remarks. |
|---|---|---|---|---|---|---|---|
| 1933. | | H. M. S. | | | | | (A) N |
| June 24th | P | 22 0 33 | 6 | ... | ... | 3,900 | Very great. |
| | S | 22 6 3 | 15 | ... | ... | ... | |
| | L | 22 10 46 | 28 | ... | ... | ... | |
| | M | 22 14 16 | ... | 3069 | ... | ... | |
| | F | ? | ... | ... | ... | ... | (A) E instrument stopped. |
| | P | 8 53 51 | 4 | ... | ... | 1,450 | (A) N Great. |
| Aug. 11th | S | 8 56 45 | 6 | ... | ... | ... | |
| | L | 8 57 50 | 8 | ... | ... | ... | |
| | M | 8 59 32 | ... | 483 | ... | ... | |
| | F | 9 56 49 | ... | ... | ... | ... | |
| | P | 8 54 25 | 4 | ... | ... | ... | (A) E |
| | S | 8 56 49 | 6 | ... | ... | ... | |
| | L | 8 27 49 | 8 | ... | ... | ... | |
| | M | 8 59 33 | ... | ... | 948 | ... | |
| | F | 9 56 49 | ... | ... | ... | ... | |
| ,, 25th | P | 7 54 54 | 5 | ... | ... | 1,900 | (A) N Very great. |
| | S | 7 58 9 | 10 | ... | ... | ... | |
| | L | 7 59 39 | 24 | ... | ... | ... | |
| | M | ? | ... | ... | ... | ... | |
| | F | ? | ... | ... | ... | ... | |

| Date. | Phase. | Time. G. M. T. | Period (Sec.). | Amplitude (μ) A N | Amplitude (μ) A E | Distance (Km.). Δ | Remarks. |
|---|---|---|---|---|---|---|---|
| 1933. | | H. M. S. | | | | | (A) E |
| Aug. 25th | P | 7 54 55 | 5 | ... | ... | 1,900 | Very great. |
| | S | 7 58 9 | 12 | ... | ... | ... | |
| | L | 7 59 41 | 24 | ... | ... | ... | |
| | M | ? | ... | ... | ... | ... | |
| | F | ? | ... | ... | ... | ... | |
| | | | | | | | (A) N |
| Nov. 28th | P | 11 15 7 | 5 | ... | ... | 2,950 | Moderate |
| | S | 11 19 43 | 7 | ... | ... | ... | |
| | L | 11 24 14 | 12 | ... | ... | ... | |
| | $M_1$ | 11 25 30 | ... | 259 | ... | ... | |
| | $M_2$ | 11 27 12 | ... | 259 | ... | ... | |
| | F | 12 26 55 | ... | ... | ... | ... | |
| | P | 11 15 16 | 5 | ... | ... | ... | (A) E |
| | S | 11 19 54 | 7 | ... | ... | ... | |
| | L | 11 24 23 | 12 | ... | ... | ... | |
| | M | 11 27 31 | ... | 138 | ... | ... | |
| | F | 12 26 59 | ... | ... | ... | ... | |

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# STATION—KODAIKANAL.

φ=10° 13′ 50″ ; λ=77° 28′ 00″; *h*=2343m. ; *Sub-soil*—Rock.

*Apparatus.*—Milne Shaw Seismograph (E-W).

TABLE D 5.

| | Steady Mass (Kg). | T | Vm | ε | S* (mm) | Paper speed mm/min. | Up |
|---|---|---|---|---|---|---|---|
| $A_E$ | 0·45 | 11·5 | 250 | 20:1 | 44 (appr.) | 8 | E |

| Date. | Phase. | Time. G. M. T. | Period (Sec.). | Amplitude (mm) $A_E$ | Distance (Km.) △ | Remarks. |
|---|---|---|---|---|---|---|
| 1933. | | H. M. S. | | | | |
| Jan. 1st | .. | ... | ... | 5·00 | 1000 | No time marks. |
| ,, 7th | P | 4 17 22 | ... | ... | 2800 | |
| | S | 4 26 08 | .. | ... | .. | |
| | L | 4 44 11 | ... | ... | .. | |
| | M | 4 53 06(1) | ... | 1·50 | .. | |
| | | 4 55 54(2) | ... | ... | .. | |
| | F | ? | .. | ... | ... | No record at time of F. |
| ,, 9th | P | 2 07 15 | .. | ... | 680 | |
| | S | 2 10 13 | ... | ... | .. | |
| | L | 2 11 00 | .. | ... | .. | |
| | M | 2 11 41 | ... | 16·25 | .. | Lines overlapping |
| | F | ? | ... | ... | .. | |
| ,, 11th | P | 18 13 51 | .. | ... | 680 | |
| | S | 18 16 49 | ... | ... | .. | |
| | L | 18 22 03 | .. | ... | .. | |
| | M | 18 23 22 | ... | 1·50 | .. | |
| | F | 19 20 00 | .. | ... | .. | |
| ,, 17th | P | 16 14 15 | ... | ... | .. | |
| | F | 16 14 32 | ... | ... | .. | Tremors. |
| ,, 17th | P | 18 56 22 | ... | ... | 1800 | |
| | S | 19 02 45 | ... | ... | .. | |
| | L | 19 06 09 | ... | ... | .. | |
| | M | 19 12 19 | ... | 1·00 | .. | |
| | F | 20 17 00 | ... | ... | .. | |
| ,, 17th | P | 22 20 38 | ... | ... | .. | |
| | F | 22 52 00 | ... | ... | .. | Very feeble shock. |
| ,, 20th | P | 12 19 15 | ... | ... | 870 | |
| | S | 12 22 51 | ... | ... | .. | |
| | L | 12 25 00 | ... | ... | .. | |
| | M | ... | ... | ... | .. | |
| | F | 12 41 00 | ... | ... | .. | Feeble shock. |
| 21st | P | ... | ... | ... | .. | |
| | S | ... | ... | ... | .. | |
| | L | ... | ... | .. | .. | |
| | M | ... | ... | 30·00 | .. | |
| | F | ... | ... | ... | .. | Lines overlapping and times not possible to measure |
| Jan. 27th —28th | P | 23 02 15 | ... | ... | .. | |
| | F | 00 23 00 | ... | ... | .. | |
| ,, 28th | P | 3 13 41 | ... | ... | .. | |
| | F | 3 18 00 | ... | ... | .. | |
| Feb. 13th | P | 2 56 26 | ... | ... | 1366 | |
| | S | 3 01 43 | ... | ... | .. | |
| | L | 3 04 02 | ... | ... | .. | |
| | M | 3 13 34 | ... | 1·75 | .. | |
| | F | 3 47 00 | ... | ... | .. | |
| ,, 13th | P | 4 30 00 | ... | ... | .. | |
| | F | 5 00 00 | ... | ... | .. | |
| ,, 21st | P | 19 08 22 | ... | ... | 1210 | |
| | S | 19 13 13 | ... | ... | .. | |
| | L | 19 17 45 | ... | ... | .. | |
| | M | ... | ... | ... | .. | |
| | F | 19 39 00 | ... | ... | .. | |
| ,, 22nd | P | 18 03 37 | ... | ... | 1335 | |
| | S | 18 08 45 | ... | ... | .. | |
| | L | 18 12 08 | ... | ... | .. | |
| | M | 18 15 04 | ... | 0·75 | .. | |
| | F | 18 33 00 | ... | ... | .. | |
| ,, 23rd | iP | 8 28 58 | ... | ... | 5155 | |
| | S | 8 45 23 | ... | ... | .. | |
| | L | 9 11 52 | ... | ... | .. | |
| | M | 9 27 33 | ... | 1·75 | .. | |
| | F | 10 39 00 | ... | ... | .. | |
| Mar. 2nd | iP | 17 41 45 | ... | ... | 2857 | |
| | iS | 17 50 36 | ... | ... | .. | |
| | L | ? | ... | ... | .. | |
| | M | 18 13 38 | ... | 98·0 | .. | |
| | F | 22 39 00 | ... | ... | .. | |
| ,, 3rd | P | 2 27 24 | ... | ... | .. | |
| | F | 2 52 00 | ... | ... | .. | |
| ,, 11th | P | 14 33 09 | ... | ... | 3012 | |
| | S | 14 42 21 | ... | ... | .. | |
| | L | 15 04 08 | ... | .. | .. | |
| | M | ... | ... | ... | .. | |
| | F | 15 47 00 | ... | .. | .. | |
| 1933. | | H. M. S. | | | | |
| Mar. 11th | iP | 19 42 09 | ... | ... | 3980 | |
| | S | 19 53 15 | ... | ... | ... | |
| | L | ... | ... | ... | ... | |
| | M | ... | ... | ... | ... | |
| | F | 20 47 00 | ... | ... | ... | |
| ,, 12th | P | ... | ... | ... | ... | |
| | S | ... | ... | ... | ... | |
| | L | ... | ... | ... | ... | |
| | M | ... | ... | ... | ... | |
| | F | ... | ... | ... | ... | |
| ,, 17th | iP | 16 07 24 | ... | ... | 3260 | |
| | S | 16 17 08 | ... | ... | ... | |
| | L | 16 31 15 | ... | ... | ... | |
| | M | 16 46 13 | ... | 0·75 | ... | |
| | F | 17 32 00 | ... | ... | ... | |
| ,, 17th | iP | 19 41 11 | ... | ... | 2235 | |
| | iS | 19 48 34 | ... | ... | ... | |
| | L | 19 53 00 | ... | ... | ... | |
| | M | 20 04 56 | ... | 2·0 | ... | |
| | F | 21 03 00 | ... | ... | ... | |
| ,, 18th | P | 3 17 15 | ... | ... | ... | |
| | F | 4 41 00 | ... | ... | ... | |
| ,, 31st | P | 22 15 00 | ... | ... | ... | |
| | F | 22 33 00 | ... | ... | ... | |
| April 9th | P | 2 57 11 | ... | ... | | |
| | S | 3 06 04 | ... | ... | ... | |
| | L | 3 22 27 | ... | ... | ... | |
| | M | ... | ... | ... | ... | |
| | F | 4 13 00 | ... | ... | ... | |
| ,, 9th | P | 5 12 15 | ... | ... | ... | |
| | F | 5 39 00 | ... | ... | ... | |
| ,, 10th | P | 11 09 19 | ... | ... | | |
| | F | 11 48 00 | ... | ... | ... | |
| ,, 16th | P | 06 19 09 | ... | ... | | |
| | F | 6 42 00 | ... | ... | ... | |
| ,, 16th | P | 7 00 09 | ... | ... | ... | |
| | F | 7 28 00 | ... | ... | ... | |

| Date. | Phase. | Time. G. M. T. | Period (Sec.). | Amplitude (mm.) $A_E$ | Distance (Km). △ | Remarks. |
|---|---|---|---|---|---|---|
| 1933. | | H. M. S. | | | | |
| Jan. 27th —28th | P | 23 02 15 | ... | ... | .. | Very feeble shock. |
| | F | 00 23 00 | ... | ... | .. | |
| ,, 28th | P | 3 13 41 | ... | ... | .. | Very feeble shock. |
| | F | 3 18 00 | ... | ... | .. | |
| Feb. 13th | P | 2 56 26 | ... | ... | 1366 | |
| | S | 3 01 43 | ... | ... | .. | |
| | L | 3 04 02 | ... | ... | .. | |
| | M | 3 13 34 | ... | 1·75 | .. | |
| | F | 3 47 00 | ... | ... | .. | |
| ,, 13th | P | 4 30 00 | ... | ... | .. | |
| | F | 5 00 00 | ... | ... | .. | Feeble shock. |
| ,, 21st | P | 19 08 22 | ... | ... | 1210 | |
| | S | 19 13 13 | ... | ... | .. | |
| | L | 19 17 45 | ... | ... | .. | |
| | M | ... | ... | ... | .. | |
| | F | 19 39 00 | ... | ... | .. | Feeble shock. |
| ,, 22nd | P | 18 03 37 | ... | ... | 1335 | |
| | S | 18 08 45 | ... | ... | .. | |
| | L | 18 12 08 | ... | ... | .. | |
| | M | 18 15 04 | ... | 0·75 | .. | |
| | F | 18 33 00 | ... | ... | .. | |
| ,, 23rd | iP | 8 28 58 | ... | ... | 5155 | |
| | S | 8 45 23 | ... | ... | .. | |
| | L | 9 11 52 | ... | ... | .. | |
| | M | 9 27 33 | ... | 1·75 | .. | |
| | F | 10 39 00 | ... | ... | .. | |
| Mar. 2nd | iP | 17 41 45 | ... | ... | 2857 | |
| | iS | 17 50 36 | ... | ... | .. | |
| | L | ? | ... | ... | .. | |
| | M | 18 13 38 | ... | 98·0 | .. | |
| | F | 22 39 00 | ... | ... | .. | |
| ,, 3rd | P | 2 27 24 | ... | ... | .. | |
| | F | 2 52 00 | ... | ... | .. | Tremors. |
| ,, 11th | P | 14 33 09 | ... | ... | 3012 | |
| | S | 14 42 21 | ... | ... | .. | |
| | L | 15 04 08 | ... | .. | .. | |
| | M | ... | ... | ... | .. | |
| | F | 15 47 00 | ... | .. | .. | Feeble shock. |
| 1933. | | H. M. S. | | | | |
| Mar. 11th | iP | 19 42 09 | ... | ... | 3980 | |
| | S | 19 53 15 | ... | ... | ... | |
| | L | ... | ... | ... | ... | |
| | M | ... | ... | ... | ... | |
| | F | 20 47 00 | ... | ... | ... | Feeble shock. |
| ,, 12th | P | ... | ... | ... | ... | |
| | S | ... | ... | ... | ... | |
| | L | ... | ... | ... | ... | |
| | M | ... | ... | ... | ... | |
| | F | ... | ... | ... | ... | Tremors No time marks. |
| ,, 17th | iP | 16 07 24 | ... | ... | 3260 | |
| | S | 16 17 08 | ... | ... | ... | |
| | L | 16 31 15 | ... | ... | ... | |
| | M | 16 46 13 | ... | 0·75 | ... | |
| | F | 17 32 00 | ... | ... | ... | |
| ,, 17th | iP | 19 41 11 | ... | ... | 2235 | |
| | iS | 19 48 34 | ... | ... | ... | |
| | L | 19 53 00 | ... | ... | ... | |
| | M | 20 04 56 | ... | 2·0 | ... | |
| | F | 21 03 00 | ... | ... | ... | |
| ,, 18th | P | 3 17 15 | ... | ... | ... | |
| | F | 4 41 00 | ... | ... | ... | Tremors. |
| ,, 31st | P | 22 15 00 | ... | ... | ... | |
| | F | 22 33 00 | ... | ... | ... | Tremors. |
| April 9th | P | 2 57 11 | ... | ... | | |
| | S | 3 06 04 | ... | ... | ... | |
| | L | 3 22 27 | ... | ... | ... | |
| | M | ... | ... | ... | ... | |
| | F | 4 13 00 | ... | ... | ... | Feeble shock. |
| ,, 9th | P | 5 12 15 | ... | ... | ... | |
| | F | 5 39 00 | ... | ... | ... | Tremors. |
| ,, 10th | P | 11 09 19 | ... | ... | | |
| | F | 11 48 00 | ... | ... | ... | |
| ,, 16th | P | 06 19 09 | ... | ... | | Very feeble shock. |
| | F | 6 42 00 | ... | ... | ... | |
| ,, 16th | P | 7 00 09 | ... | ... | ... | Do. |
| | F | 7 28 00 | ... | ... | ... | Tremors. |

*S.-Tilt sensitivity, *i.e.*, the trace amplitude in mm. per second of arc tilt.

TABLE D 5—*contd.*

| Date. | Phase. | Time. G. M. T. | Period (Sec.). | Amplitude (mm.) $A_E$ | Distance (Km.). | Remarks. |
|---|---|---|---|---|---|---|
| 1933. | | H. M. S. | | | | |
| April 16th | iP | 19 27 00 | ... | ... | 2700 | |
| | iS | 19 35 30 | ... | ... | .. | |
| | L | ... | ... | ... | .. | |
| | M | ... | ... | ... | ... | |
| | F | 20 30 00 | ... | ... | ... | Feeble shock. |
| ,, 23rd | iP | 6 06 45 | ... | ... | 2235 | |
| | iS | 6 14 11 | ... | ... | ... | |
| | L | 6 23 56 | ... | ... | .. | |
| | M | 6 34 04 | ... | 0·75 | ... | |
| | F | 7 08 00 | ... | ... | ... | |
| ,, 23rd | P | 7 24 22 | ... | ... | 2800 | |
| | S | 7 33 06 | ... | ... | .. | |
| | L | 7 54 15 | ... | ... | ... | |
| | M | ... | ... | ... | ... | |
| | F | 8 29 00 | ... | ... | .. | Feeble shock. |
| ,, 27th | P | 2 49 45 | ... | ... | 3730 | |
| | S | 3 00 25 | ... | ... | ... | |
| | L | 3 21 11 | ... | ... | ... | |
| | M | 3 30 08 | ... | 5·5 | ... | |
| | F | 5 12 00 | ... | ... | ... | |
| May 8th | P | 10 54 11 | ... | ... | ... | |
| | S | ... | ... | ... | .. | |
| | L | 11 48 22 | ... | ... | ... | |
| | M | ... | ... | ... | ... | |
| | F | 12 51 00 | ... | ... | .. | Feeble shock. |
| ,, 11th | iP | 19 19 30 | ... | ... | 2360 | |
| | S | 19 27 13 | ... | ... | ... | |
| | C | 19 42 30 | ... | ... | ... | |
| | M | ... | ... | ... | ... | |
| | F | 20 10 00 | ... | ... | ... | Feeble shock. |
| ,, 16th | iP | 1 17 57 | ... | ... | 885 | |
| | iS | 1 21 40 | ... | ... | ... | |
| | L | 1 23 29 | ... | ... | ... | |
| | M | 1 28 13 | ... | 6·5 | ... | |
| | F | 3 13 00 | ... | ... | ... | |
| ,, 17th | P | 8 49 45 | ... | ... | ... | |
| | F | 8 52 00 | ... | ... | ... | Tremors. |
| ,, 18th | P | 10 28 32 | ... | ... | 714 | |
| | S | 10 31 35 | ... | ... | ... | |
| | L | 10 33 36 | ... | ... | .. | |
| | M | 10 35 37 | ... | 1·5 | ... | |
| | F | 10 46 00 | ... | ... | .. | |
| ,, 19th | P | 18 13 06 | .. | ... | 2765 | |
| | S | 18 21 45 | ... | ... | ... | |
| | L | 18 44 11 | ... | ... | .. | |
| | M | 18 49 28 | ... | 0·75 | ... | |
| | F | 19 48 00 | ... | ... | ... | |

| Date. | Phase. | Time. G. M. T. | Period (Sec.). | Amplitude (mm.) $A_E$ | Distance (Km.). | Remarks. |
|---|---|---|---|---|---|---|
| 1933. | | H. M. S. | | | | |
| May 20th | P | 5 48 00 | ... | ... | ... | |
| | F | 6 04 00 | ... | ... | ... | Tremors. |
| ,, 26th | P | 15 12 38 | ... | ... | ... | |
| | F | 15 17 00 | ... | ... | ... | Tremors. |
| June 2nd | P | 8 09 28 | ... | ... | ... | |
| | F | 8 25 00 | ... | ... | ... | Tremors. |
| ,, 6th | iP | 2 36 17 | ... | ... | 370 | |
| | iS | 2 37 55 | ... | ... | ... | |
| | L | 2 48 55 | ... | ... | ... | |
| | M | ... | ... | ... | ... | |
| | F | 3 23 00 | ... | ... | ... | Feeble shock. |
| ,, 7th | iP | 11 51 55 | ... | ... | 1120 | |
| | iS | 11 56 35 | ... | ... | ... | |
| | L | 12 00 00 | ... | ... | ... | |
| | M | ... | ... | ... | ... | |
| | F | 12 47 00 | ... | ... | ... | Slight shock. |
| ,, 13th | P | 23 11 50 | ... | ... | ... | |
| | F | 23 32 00 | ... | ... | ... | Tremors. |
| ,, 18th | P | 21 48 35 | ... | ... | 2730 | |
| | S | 21 56 41 | ... | ... | ... | |
| | L | 22 06 00 | ... | ... | ... | |
| | M | 22 18 31 | ... | 1·75 | ... | |
| | F | 23 31 00 | ... | ... | ... | |
| ,, 19th | P | 0 11 00± | ... | ... | ... | |
| | F | 0 19 00 | ... | ... | ... | Tremors. |
| ,, 19th | P | 13 04 45 | ... | ... | ... | |
| | F | 13 09 00 | ... | ... | ... | Tremors. |
| ,, 24-25 | iP | 22 01 05 | ... | ... | 1300 | |
| | iS | 22 06 09 | ... | ... | ... | |
| | L | 22 09 40 | ... | ... | ... | |
| | M | 22 12 25 | ... | 113·0 | ... | |
| | F | 1 12 00 | ... | ... | ... | |
| ,, 25th | P | 5 58 10 | ... | ... | ... | |
| | F | 6 14 00 | ... | ... | ... | Tremors. |
| July 9th | Lines overlapping | | ... | ... | ... | Feeble shock. |
| ,, 9th | P | 12 41 56 | ... | ... | 3000 | |
| | S | 12 51 00 | ... | ... | ... | |
| | L | 13 11 10 | ... | ... | ... | |
| | M | 13 20 27 | ... | 0·8 | ... | |
| | F | 13 56 00 | ... | ... | ... | |
| ,, 21st | No time marks—beginning 20 h. 30 m. | | ... | ... | about | Feeble shock. |

| Date. | Phase. | Time. G. M. T. | Period (Sec.). | Amplitude (mm.) $A_E$ | Distance (Km.). | Remarks. |
|---|---|---|---|---|---|---|
| 1933. | | H. M. S. | | | | |
| ,, 22nd | P | 21 19 20 | ... | ... | 2050 | |
| | S | 21 26 15 | ... | ... | ... | |
| | L | 21 42 40 | ... | ... | ... | |
| | M | 21 54 59 | ... | 1·5 | ... | |
| | F | 23 16 00 | ... | ... | ... | |
| ,, 24th | No time marks—beginning 20 hours. | | ... | ... | about | Feeble shock. |
| Aug. 11th | iP | 8 59 30 | ... | ... | 1100 | |
| | iS | 9 03 59 | ... | ... | ... | |
| | L | 9 09 11 | ... | ... | ... | |
| | M | ... | ... | ... | ... | |
| | F | 9 52 00 | ... | ... | ... | Feeble shock. |
| ,, 13th | iP | 9 36 42 | ... | ... | 2100 | |
| | S | 9 43 45 | ... | ... | ... | |
| | L | 9 48 03 | ... | ... | ... | |
| | M | ... | ... | ... | ... | |
| | F | 10 29 00 | ... | ... | ... | Feeble shock. |
| ,, 20th | P | 11 53 36 | ... | ... | 2000 | |
| | S | 12 00 25 | ... | ... | ... | |
| | L | 12 08 22 | ... | ... | ... | |
| | M | ... | ... | ... | ... | |
| | F | 12 56 00 | ... | ... | ... | Feeble shock. |
| ,, 25th | iP | 18 57 00 | ... | ... | 1420 | |
| | iS | 19 02 23 | ... | ... | ... | |
| | L | 19 07 18 | ... | ... | ... | |
| | M | 19 14 17 | ... | 37·0 | ... | |
| | F | 21 07 00 | ... | ... | ... | |
| ,, 28th | P | 22 34 14 | ... | ... | ... | |
| | S | ... | ... | ... | ... | |
| | L | ... | ... | ... | ... | |
| | M | ... | ... | ... | ... | |
| | F | ... | ... | ... | ... | |
| ,, 28-29 | P | 22 37 44 | ... | ... | 3300 | Overlapping. |
| | S | 22 47 30 | ... | ... | ... | |
| | L | 23 08 26 | ... | ... | ... | |
| | M | 23 18 27 | ... | 4·25 | ... | Overlapping. |
| | F | 1 47 00 | ... | ... | ... | |
| Sept. 2nd | iP | 16 55 45 | ... | ... | ... | |
| | F | 17 49 00 | ... | ... | ... | Feeble shock. |
| ,, 6th | P | 17 42 41 | ... | ... | ... | |
| | F | 18 30 00 | ... | ... | ... | Tremors. |
| ,, 6th | iP | 22 21 46 | ... | ... | 1000 | |
| | S | 22 25 55 | ... | ... | ... | |
| | L | ? | ... | .. | ... | |
| | M | ? | ... | 1·5 | ... | Times uncertain for L and M. |
| | E | 23 36 00 | ... | ... | ... | |

TABLE D 5—*concld.*

| Date. | Phase. | Time G. M. T. | Period (Sec.). | Amplitude (mm.). $A_E$ | Distance (Km.) Δ | Remarks. |
|---|---|---|---|---|---|---|
| 1933. | | H. M. S. | | | | |
| Sept. 7th | P | 18 02 19 | ... | ... | 2000 | |
| | S | 18 08 54 | ... | ... | ... | |
| | L | ... | ... | ... | ... | |
| | M | ... | ... | ... | ... | |
| | F | 18 35 00 | ... | ... | ... | Feeble shock. |
| ,, 7th | P | 23 18 10 | ... | ... | ... | |
| | F | 23 41 00 | ... | ... | ... | Tremors. |
| ,, 9th | P | 21 43 24 | ... | ... | ... | |
| | F | 22 36 00 | ... | ... | ... | Feeble shock. |
| ,, 21st | P | 10 28 12 | ... | ... | ... | |
| | F | 10 47 00 | ... | ... | ... | Tremors. |
| ,, 24th | P | 15 35 36 | ... | ... | 2470 | |
| | S | 15 43 32 | ... | ... | ... | |
| | L | 16 07 20 | ... | ... | ... | |
| | M | ... | ... | ... | ... | |
| | F | 16 56 00 | ... | ... | ... | Feeble shock. |
| ,, 25th | P | 13 54 31 | ... | ... | 2100 | |
| | S | 14 01 33 | ... | ... | ... | |
| | L | 14 09 49 | ... | ... | ... | |
| | M | ... | ... | ... | ... | |
| | F | 14 31 00 | ... | ... | ... | Feeble shock. |
| ,, 25th | P | 19 02 13 | ... | ... | 1220 | |
| | iS | 19 07 04 | ... | ... | ... | |
| | L | 19 16 04 | ... | ... | ... | |
| | M | 19 18 35 | ... | 2·0 | ... | |
| | F | 20 35 00 | ... | ... | ... | |
| ,, 30th | P | 14 31 33 | ... | ... | 2600 | |
| | S | 14 39 48 | ... | ... | ... | |
| | L | 14 50 48 | ... | ... | ... | |
| | M | ... | ... | ... | ... | |
| | F | 15 53 00 | ... | ... | ... | Feeble shock |
| Oct. 2nd | iP | 15 49 28 | ... | ... | 453 | |
| | S | 16 03 55 | ... | ... | ... | |
| | L | 16 41 28 | ... | ... | ... | |
| | M | 17 03 50 | ... | 1·6 | ... | |
| | F | 18 04 00 | ... | ... | ... | |
| 1933. | | H. M. S. | | | | |
| Oct. 5th | P | 13 36 03 | ... | ... | 1260 | |
| | iS | 13 41 00 | ... | ... | ... | |
| | iL | 13 16 25 | ... | ... | ... | |
| | M | 13 49 19 | ... | 2·5 | ... | |
| | F | 14 26 00 | ... | ... | ... | |
| ,, 16th | P | 4 44 35 | ... | ... | 310 | |
| | S | 4 45 55 | ... | ... | ... | |
| | L | 4 47 47 | ... | ... | ... | |
| | M | 4 49 14 | ... | 1·6 | ... | |
| | F | 5 04 00 | ... | ... | ... | |
| ,, 22nd | P | 14 14 16 | ... | ... | ... | |
| | F | 14 29 00 | ... | ... | ... | Tremors. |
| ,, 23rd | P | 11 45 44 | ... | ... | 1366 | |
| | iS | 11 51 00 | ... | ... | ... | |
| | iL | 11 55 00 | ... | ... | ... | |
| | M | 11 58 06 | ... | 0·9 | ... | Lines overlapping. |
| | F | 12 25 00 | ... | ... | ... | Times uncertain. |
| ,, 26th | P | 12 27 22 | ... | ... | ... | |
| | F | 13 50 00 | ... | ... | ... | Tremors. |
| ,, 30th | P | 11 44 35 | ... | ... | ... | |
| | F | 11 51 00 | ... | ... | ... | Tremors. |
| Nov. 2nd | P | 12 40 11 | ... | ... | ... | |
| | F | 13 46 00 | ... | ... | ... | Tremors. |
| ,, 5th | iP | 20 32 42 | ... | ... | 435 | |
| | S | 20 34 35 | ... | ... | ... | |
| | iL | 20 37 14 | ... | ... | ... | |
| | M | 20 37 32 | ... | 0·5 | ... | |
| | F | 21 5 00 | ... | ... | ... | |
| ,, 20th | iP | 23 34 54 | ... | ... | 4040 | |
| | iS | 23 46 03 | ... | ... | ... | |
| | iL | 0 13 22 | ... | ... | ... | |
| | M | 0 22 40 | ... | 5·0 | ... | |
| | F | 2 13 00 | ... | ... | ... | |
| 1933. | | H. M. S. | | | | |
| Nov. 22nd | iP | 12 53 06 | ... | ... | 3230 | |
| | iS | 13 02 45 | ... | ... | ... | |
| | L | 13 19 00 | ... | ... | ... | |
| | M | 13 24 30 | ... | 0·4 | ... | |
| | F | 14 19 00 | ... | ... | ... | |
| ,, 23rd | P | 16 55 40 | ... | ... | ... | |
| | F | 17 06 00 | ... | ... | ... | Tremors. Lines overlapping. |
| ,, 28th | P | 11 15 30 | ... | ... | 1550 | |
| | iS | 11 21 10 | ... | ... | ... | |
| | iL | 11 29 25 | ... | ... | ... | |
| | M | 11 30 34 | ... | 2·0 | ... | |
| | F | 12 24 00 | ... | ... | ... | |
| Dec. 2nd | P | 2 25 50 | ... | ... | 534 | |
| | S | 2 28 08 | ... | ... | ... | |
| | iL | 2 29 00 | ... | ... | ... | |
| | M | 2 29 32 | ... | 1·0 | ... | |
| | | 2 38 00 | ... | ... | ... | |
| ,, 4th | P | 14 46 00 | ... | ... | ... | |
| | F | 14 59 00 | ... | ... | ... | Tremors. Lines overlapping. |
| ,, 4th | P | 22 50 15 | ... | ... | 260 | |
| | S | 22 51 23 | ... | ... | ... | |
| | L | 22 52 43 | ... | ... | ... | |
| | M | 22 52 49 | ... | 0·6 | ... | |
| | F | 23 22 00 | ... | ... | ... | |
| ,, 9th | P | 8 02 32 | ... | ... | 500 | |
| | S | 8 04 42 | ... | ... | ... | |
| | L | 8 05 51 | ... | ... | ... | |
| | M | 8 06 30 | ... | 0·9 | ... | |
| | F | 8 34 00 | ... | ... | ... | |
| ,, 12th | P | 14 23 05 | ... | ... | 1000 | |
| | S | 14 27 10 | ... | ... | ... | |
| | L | 14 32 48 | ... | ... | ... | |
| | M | 14 33 35 | ... | 0·5 | ... | |
| | F | 15 13 00 | ... | ... | ... | |

T. ROYDS,

*Director, Madras and Kodaikanal Observatories.*

The following table contains a list of earthquakes that were reported by voluntary observers from various stations:—

TABLE D-6.

| Station. | Date. | G.M.T. of earthquake. | Duration. | Intensity Rossi-Forel scale. | No. of shocks. | REMARKS. |
|---|---|---|---|---|---|---|
| | 1933. | H. M. | Sec. | | | |
| Gauhati | Jan. 1 | 19 50 | about 90 | 6 | 2 | |
| Salonah | ,, 1 | 20 15 | 4 5 | 4 | 1 | |
| Drosh. | ,, 5 | 19 55 | 20 | 6 | 1 | |
| | | 23 00 | 15 | | 3 | |
| Lahore | ,, 9 | 2 07 | 3 | 5 | 1 | |
| R. A. F. Peshawar | ,, 9 | 2 07 | 90 | 7 | 3 | |
| Cherat | ,, 9 | 2 04 | 40 | 7 | 2 | |
| Drosh | ,, 9 | 2 10 | 80 | 7 | 1 | |
| Rawalpindi. | ,, 9 | 2 01 | 120 | 8 | 2 | |
| Gurez | ,, 9 | 2 10 | 15 | 5 | 3 | |
| Skardu | ,, 9 | 2 05 | 10 | 6 | 3 | |
| Gilgit | ,, 9 | 2 03 | Nearly 10 & 12 | 5 | 2 | |
| Dras | ,, 9 | 2 12 | 30 | 8 | 3 | |
| Gauhati | ,, 10 | 24 00 | 10 | 6 | 1 | |
| Drosh | ,, 11 | 15 55 | 40 | 6 | 1 | |
| Drosh | ,, 20 | 0 15 | 16 | 6 | 1 | |
| Gauhati | Feb. 6 | 12 46 | 20 | 6 | 1 | |
| Gauhati | ,, 8 | 1 15 | 30 | 5 | 3 | |
| Drosh. | ,, 17 | 12 11 | about 90 | 6 | 2 | |
| Dhubri | Mar. 9 | 16 38 | 12 | 7 | 3 | |
| Cherrapunji | ,, 6 | 13 6 | 10 | 3 | 1 | |
| Dhubri | ,, 6 | 13 7 | 5 | 7 | 2 | |
| Dhubri | ,, 6 | 13 44 | 22 | 7 | 3 | |
| Dhubri | ,, 6 | 17 54 | 7 | 7 | 3 | |
| Salonah | ,, 6 | 13 8 | about 10 to 12 | 5 | | |
| Rangpur | ,, 6 | 13 6 | 32 | 5 | 40 | |
| Gauhati | ,, 6 | 13 13 | about 80 | 6 | 3 | |
| | | 18 00 | 10 | | 1 | |
| Dhubri | ,, 7 | 10 21 | 4 | 7 | 2 | |
| Dhubri | ,, 7 | 3 3 | 3 | 6 | 1 | |
| Mymensingh | ,, 7 | 00 12 | 2 | 6 | 1 | |
| Chaman | ,, 11 | 10 25 | 2 | 5 | ... | |
| Dras. | ,, 13 | 18 10 | 40 | 8 | 2 | |
| Dhubri | ,, 14 | 2 6 | 4 | 6 | 2 | |
| R. A. F. Quetta | ,, 30 | 8 41 | 15 | 5 | 1 | |
| Akyab | ,, 31 | 8 10 | 2 | 3 | 2 | |
| Skardu | Apl. 1 | 16 16 | 5 | 3 | 5 | |
| Dhubri | Apl. 5 | 17 42 | 4 | 7 | 2 | |
| Dhubri | ,, 6 | 3 16 | 6 | 7 | 4 | |
| Dhubri | ,, 17 | 4 23 | 48 | 7 | 5 | |
| Dhubri | ,, 20 | 10 27 | 14 | 7 | 3 | |
| Drosh. | ,, 25 | 15 30 | 6 5 | 3 | 2 | |
| Dhubri | ,, 28 | 7 54 | 26 | 7 | 3 | |
| Dhubri | May 17 | 12 16 | 6 | 7 | 3 | |
| Lahore | ,, 17 | 9 44 | 30 | 68 | 1 | |
| Sialkot | ,, 17 | 9 44 | 2 | 3 | 1 | |
| Dhubri | ,, 19 | 1 50 | 6 | 7 | 3 | |
| Drosh | ,, 24 | 8 35 | 30 | 4 | 1 | |
| Gauhati | ,, 26 | 14 18 | 12 | 7 | 1 | |
| Dhubri | ,, 26 | 14 33 | 20 | 6 | 1 | |
| Drosh | ,, 27 | 22 45 | 90 | 6 | 1 | |
| Drosh. | June 3 | 18 01 | 90 | 6 | 3 | |
| Gauhati | July 13 | 23 21 | about 15 | 6 | 1 | |
| Salonah | ,, 13 | 23 03 | about 10 | 6 | .. | |
| Poona | ,, 16 | 23 50 | about 5 | 5 | 1 | |
| Salonah | ,, 18 | 13 07 | about 2 or 3 | 3 | 1 | |
| Salonah | ,, 27 | 3 36 | 5-7 | 3 | 1 | |
| Dras. | ,, 29 | 4 11 | 24 | 8 | 3 | |
| Skardu | Aug. 3 | 9 00 | 10 | 6 | 1 | |
| Yatung (Tibet) | ,, 30 | 13 13 | 30 | 4 | Several tremors. | |
| Shillong | Sep. 2 | 10 49 | 2 | 5 | 1 | |
| Cooch Behar | ,, 24 | 15 41 | about 5 | 6 | 1 | |
| Akyab | Nov. 7 | 2 19 | 2 | 3 | 2 | |
| Chaman | ,, 12 | 2 15 | 1 | 3 | 1 | |
| Salonah | ,, 29 | 5 56 | about 5 | 4 | Small vibrations. | |
| Salonah | Dec. 4 | 14 40 | 10-12 | 4 | 1 | |
| Cherrapunji | ,, 4 | 14 40 | 10 | 3 | 2 | |
| Gauhati | ,, 4 | 14 41 | 5-7 | 5 | 1 | |
| Sibsagar | ,, 4 | 14 40 | about 70 | 6 | 1 | |
| Shillong | ,, 4 | 14 40 | about 20 | 4 | 2 | |
| Salonah | ,, 5 | 13 38 | about 5 | 4 | 1 | |
| Srinagar | ,, 21 | 8 33 | 2 | 6 | 2 | |

J. M. SIL,
*Meteorologist,*
*Poona.*

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| Instructions to Observers at the 2nd and 3rd class Observatories, 2nd Edition 1934. | Departmental. |
| Tables for the Reduction of Meteorological Observations in India, 3rd Edition (1925) . . . Rs. 5-8 | Ditto. |
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GOVERNMENT OF INDIA

# METEOROLOGICAL DEPARTMENT

# INDIA WEATHER REVIEW, 1933

# INTRODUCTION

## CONTENTS



**Published by Authority of the Government of India**

UNDER THE DIRECTION OF

**C. W. B. NORMAND, D.Sc.,**

*Director General of Observatories*

DELHI: MANAGER OF PUBLICATIONS
1936



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# INDIA WEATHER REVIEW, 1933

## ANNUAL SUMMARY

## PART A.

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# INDIA WEATHER REVIEW

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## PART B

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METEOROLOGICAL DEPARTMENT

# INDIA WEATHER REVIEW, 1933

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## PART D.

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Indian Book Shop, Benares City.
Indian School Supply Depot, 309, Bow Bazar St., Calcutta.
Insurance Publicity Co., Ltd., Lahore.
International Book Service, Poona 4.
Jaina & Bros., Mori Gate, Delhi, Messrs. J. M.
James Murray & Co., 12, Govt. Place, Calcutta (for Meteorological publications only).
Kali Charan & Co., Municipal Market, Calcutta.
Kamala Book Depot, 15, College Square, Calcutta.
Kamala Book Stores, Bankipore, Patna.
Karnataka Publishing House, Bangalore City.
Keale & Co., Karachi.
Krishnaswami & Co., Teppakulam P. O., Trichinopoly Fort, Messrs. S.
Lahiri & Co., Calcutta, Messrs. S. K.
Law Printing House, 11, Mount Road, Madras.
Law Publishing Co., Mylapore, Madras.
Lawrence and Mayo, Ltd., Bombay (for Meteorological publications only).
Local Self-Govt. Institute, Bombay.
London Book Co. (India), Arbab Road, Peshawar, Murree, Nowshera, Rawalpindi.
London Book Depot, B. I. Bazar Bareilly, U. P.
Malhotra & Co., Quetta, Messrs. U. P.
Mohanlal Dossabhai Shah, Rajkot.
Nandkishore & Bros., Chowk, Benares City.
Nateson & Co., Publishers, George Town, Madras, Messrs. G. A.
New Book Co., "Kitab Mahal", 192, Hornby, Road, Bombay.
Newman & Co., Ltd., Calcutta, Messrs. W.
North India Christian Tract and Book Society, 18, Clive Road, Allahabad.
Oriental Book Supplying Agency, 15, Sukhrawar, Poona City.
Oxford Book and Stationery Company, Delhi, Lahore, Simla, Meerut and Calcutta.
Parikh & Co., Baroda, Messrs. B.
Pioneer Book Supply Co., 20, Shib Narayan Das Lane, Calcutta and 219, Cloth Market, Delhi.
Popular Book Depot, Grant Road, Bombay.
Punjab Religious Book Society, Lahore.
Punjab Sanskrit Book Depot, Saidmitha Street, Lahore.
Raghunath Prasad & Sons, Patna City.
Rama Krishna & Sons, Booksellers, Anarkali, Lahore.
Ram Krishna Bros., Opposite Bishrambag, Poona City
Ram Narain Lal, Katra, Allahabad.
Ramesh Book Depot and Stationery Mart, Kashmere Gate, Delhi.
Ray & Sons, 43, K. & L. Edwardes Road, Rawalpindi, Murree and Peshawar, Messrs. J.
Ray Chowdhury & Co., 68/5, Ashutosh Mukherjee Road, Calcutta.
Rochouse & Sons, Madras.
Roy Chowdhury & Co., 11, College Square, Calcutta, Messrs. N. M.
Sampson William & Co., 127-B, The Mall, Cawnpur.
Sarcar & Sons, 15, College Square, Calcutta, Messrs. M. C.
Sarkar & Co., 2, Shama Charan De Street, Calcutta, Messrs. P. C.
Scientific Publishing Co., 9, Taltola Lane, Calcutta.
Seshachalam & Co., Masulipatam, Messrs. M.
Shivji & Co., P. O. Chauliaganj, Cuttack.
Shri Shankar Karnataka Pustaka Bhandara, Malamuddi, Dharwar.
S. P. Bookstall, 21, Budhwar, Poona.
Standard Bookstall, Karachi
Standard Bookstall, Quetta.
Standard Book Depot, Lahore, Dalhousie and Delhi.
Standard Law Book Society, 5, Hastings Street, Calcutta.
Standard Literature Company, Ltd., Calcutta.
Students' Popular Depot, Kacheri Road, Lahore.
Surat and District Trading Society, Surat.
Taraporevala Sons & Co., Bombay, Messrs. D. B.
Thacker & Co., Ltd., Bombay.
Thacker, Spink & Co., Ltd., Calcutta and Simla.
Tripathi & Co., Booksellers, Princes Street, Kalbadevi Road, Bombay, Messrs. N. M.
Union Stores, Indore City.
University Book Agency, Kacheri Road, Lahore.
Upper India Publishing House, Ltd., Literature Palace, Ammuddaula Park, Lucknow.
Varadachary & Co., Madras, Messrs. P.
Wheeler & Co., Allahabad, Calcutta and Bombay, Messrs. A. H.
Young Man & Co., Ajmer and Egerton Road, Delhi,

* Agent for publications on aviation only.